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AMERICAN AND OTHER PATENTED INVENTIONS.

OCTOBER, 1833.

TO THE COMMITTEE ON PUBLICATIONS.

An investigation of a formula for calculating the transfer of water from one level to another, by the lockage of boats in canals.

By S. C. Walker.

The natural tendency of fluids towards a level, or state of equilibrium, renders it easy to transfer water from the summit level to the lowest level, by the simple opening of gates. When there is a scarcity of water in the summit level, the deficiency may be supplied by stationary steam engines, and the loss from evaporation, leakage, and other causes provided for. It is an inquiry of importance whether there may not sometimes be in the circumstances of the country through which canals pass, natural means of which advantage can be taken to effect a transference of water from the lowest to the summit level. Should such means present themselves, the expediency of using them to effect this transfer, in any proposed canal, would be determined by an estimate of the expense of locks adapted to the purpose, of the time lost by lockage, and the value of the water thus raised to the summit level, or omitted to be drained away.

With these statistics, the present inquiry has no concern, its object being to ascertain whether such a transference is possible in any instance, and if so, in what instances, and under what circumstances it is possible.

Make l' = the length, in feet, in the clear of a lock.
l'' = the average length, in feet, of a boat.
w' = the width, in feet, in the clear of a lock.

w'' = the average width, in feet, of a boat.
d' = the difference, in feet, of the levels above and below the lock.
d'' = the average depth, in feet, of the water displaced by the boat going from the upper to the lower level.
d''' = the same for the boat returning from the lower to the upper level.
m = the factor by which a cubic foot of water must be multiplied to obtain its weight in parts of a ton avoirdupois.

Then $m\,l'\,w'\,d'$ = the tons of water required to raise the water in the lock from lower to upper level.
$m\,l''\,w''\,d''$ = the tonnage of the boat descending.
$m\,l''\,w''\,d'''$ = „ „ ascending.

In canals where there are no lateral reservoirs,
$m\,l'\,w'\,d'$ = the constant loss of water transferred from upper to lower level by locking a boat in either direction.

$m\,l''\,w''\,d''$ = the tons of water transferred upwards by the descending boat by virtue of the fixed gates used as fulcra. These tons are first transferred above the upper gates by admission of the boat into the lock, by virtue of the fixedness of the lower gates: the contrary supposition involving the absurdity of maintaining that the lock receives the addition of $m\,l''\,w''\,d''$ tons without raising the level. The same amount $m\,l''\,w''\,d''$ tons is again transferred from the lower level into the lock, by the removal of the boat below the lower gates, by virtue of the fixedness of the upper gates. The contrary supposition involves the absurdity of maintaining that one horse can by his single strength elevate a number of tons, $m\,l''\,w''\,d''$, through a height d'' without any mechanical advantage.

The same reasoning may be applied to the ascending boat.

$m\,l''\,w''\,d'''$ = the tons transferred from the lock to the lower level by admission of the ascending boat, by virtue of the fixedness of the upper gates, and again transferred from the upper level to the lock by removal of the boat upwards, by virtue of the fixedness of the lower gates. The contrary hypothesis involving similar absurdities.

It will now be easy to deduce a formula for expressing the transfer of water by the two operations of locking a boat downwards and upwards, whatever be the load of the boat in either direction.

Make T = the number of tons thus transferred from one level to the other by this double operation, the positive value being upwards from lower to upper level, the negative value downwards from upper to lower level.

$$\mathrm{T} = m\,(l''\,w''\,d'' - l''\,w''\,d''' - 2\,l'\,w'\,d') \cdots\cdots (1)$$

$$= m\,\{l''\,w''\,(d'' - d''') - 2\,l'\,w'\,d'\} \cdots\cdots\cdots\cdots (2)$$

Make p = the factor by which l'' must be multiplied to equal l'.
g = similar factor for w'' to produce w'.

Then
$$p\,l'' = l'$$
$$g\,w'' = w'$$

Substituting the values of l' and w' in (2)

$$T = m\{l''\,w''\,(d'' - d''') - 2\,p\,q\,l''\,w''\,d'\}$$
$$= m\,l''\,w''\,(d'' - d''' - 2\,p\,q\,d') \cdots\cdots\cdots\cdots (3)$$

In this formula the conditions to be fulfilled in order that T may be positive, in other words that there may be a net transfer from the lower to the upper level, is that $d'' > (d''' + 2\,p\,q\,d')$. This is manifestly possible; for by constructing the boat to fit closely to the sides and end of the lock, $2\,p\,q$ may be diminished at pleasure, and d' may be taken of any amount, however small. In practice the natural limit to the smallness of d' depends upon the cost of locks and the value of time lost in lockage through a multiplicity of locks; d''' may be the depth of water displaced by an empty boat, d'' by a loaded boat; in such an instance the above conditions may be verified, even without lateral reservoirs for diminishing the loss from difference of level.

The same formula will readily enable us to calculate the transfer of water in those canals whose locks are provided with lateral reservoirs.

Make a = the factor by which the loss $2\,m\,p\,q\,l''\,w''\,d'$ must be multiplied in order to be equal to the diminished loss caused by the use of lateral reservoirs. Then we have

$$T = m\,l''\,w''\,(d'' - d''' - 2\,a\,p\,q\,d') \cdots\cdots (4)$$

Where the condition of a net gain being made by transference from the lower to the upper level is $d'' > (d''' + 2\,a\,p\,q\,d')$.

I am indebted to Mr. Millington of this city for information that a reward of £500 was offered for the invention of a method by which, without any foreign moving force, the loss from lockage in the Regent's canal, London, might be reduced to 0. Such a reduction appears to be impossible in that canal, from the circumstance that the annual average is $d'' < d'''$, and therefore, for a stronger reason, is $d'' < (d''' + 2\,a\,p\,q\,d')$.

The value of the factor a in this canal is $\frac{1}{20}$, and the loss from difference of level is diminished by lateral reservoirs to $\frac{1}{20}$ of that which would otherwise be made.

The formula (4) has been prepared for one lock with two gates, it is obvious that the same holds true of each of the locks of a canal. It is general, and embraces all the varieties of locks.

Make D'' = the annual average of depth of water displaced by descending boat.

D''' = that by ascending boat.

n = the number of passages of boats from summit level to lowest level and back, then if all the locks are constructed alike,

Make A = the annual amount transferred from one level to the other, positive value upwards.

$$A = m\,n\,l''\,w''\,(D'' - D''' - 2\,a\,p\,q\,d') \cdots\cdots (5)$$

Where the condition of positive gain is $D'' > (D''' + 2\,a\,p\,q\,d')$.

The same formula will enable us to determine in any proposed canal where D'' is much greater than D''', the smallest number of locks with which a given difference of level $\triangle$ may be overcome consistent

with the above condition, viz. that there shall be an annual gain of water transferred from the lowest to the summit level. In this case

$$n\,d' = \Delta \text{ and } n = \frac{\Delta}{d'} \quad \text{Putting } \frac{\Delta}{d'} \text{ for } n \text{ in (5)}$$

$$A = m\frac{\Delta}{d'}\,l''\,w''\,(D'' - D''' - 2\,a\,p\,q\,d') \cdots\cdots (6)$$

From which n disappears and the condition remains as before

$$D'' > (D''' + 2\,a\,p\,q\,d')$$

Transferring D''' to the other side of the inequality, we have

$$(D'' - D''') > 2\,a\,p\,q\,d' \cdots\cdots (7)$$

Dividing this inequality (7)

$$\frac{D'' - D'''}{2\,a\,p\,q} > d' \cdots\cdots (8)$$

For d' put its value $\frac{\Delta}{n}$

$$\frac{D'' - D'''}{2\,a\,p\,q} > \frac{\Delta}{n} \cdots\cdots (9)$$

From the inequality (9) it appears that the smallest integer value of n admissible under the above condition, is such that the quotient arising from the division of Δ by it, must be less than the numerical value of the expression $\frac{D'' - D'''}{2\,a\,p\,q}$, when $a = \frac{1}{20}$ as in the Regent's canal, the inequality (9) becomes

$$\frac{10\,(D'' - D''')}{p\,q} > \frac{\Delta}{n} \cdots\cdots (10)$$

In the Schuylkill canal we have $D'' > D'''$, because the amount of descending tonnage of anthracite coal, far exceeds the amount of ascending tonnage. It is therefore manifest that the condition (8), or (9), as well as (10), is possible in this canal. It is not my object to inquire at present concerning the amount of ascending and descending tonnage, a reference to the statistics of this canal would furnish any one with the means of assigning the values to the first member of these inequalities, and thence to deduce the number of locks required, and the descent of each, subject to the condition that the annual result of lockage on that canal should be a transference of a certain number of tons of water from the tide water of the Schuylkill river to the summit level of the Schuylkill canal.

The above demonstration rests upon the principle of equivalence of action and reaction. In the motion of cars or carriages on roads or rail-roads, this reaction is not perceptible; yet the theory of gravitation shows that it exists; let m = the mass transferred on a road; let n = the number of miles on the arc of the earth's circumference through which the car moves; then $m\,n$ = the momentum in this arc of rotation round the earth's axis thus effected by using successive points of this circumference as fixed fulcra: then it is evident that there exists an equivalent motion in the contrary direction of the same arc. This cannot take place among the particles at the earth's surface, accordingly, a motion of the earth's mass takes place, which

resolved in the same arc, is equivalent and contrary. In the motion of boats, this reaction takes place immediately and perceptibly by virtue of the same law. If a number of tons of coal be transported on the banks of the Schuylkill canal, an equivalent contrary motion of the earth's mass takes place unperceived; but if the same number of tons of coal be transported in the canal through the same space, then an equal number of tons of water are transferred by reaction through the same space in a contrary direction.

My only aim in the above communication has been to demonstrate a principle first applied to canals by Dr. Dewees of Pottsville, Pa., Journal Franklin Institute, vol. xi. p. 111.

Philadelphia, August 21*st*, 1833.

TO THE COMMITTEE ON PUBLICATIONS.

Description of a process and an apparatus for Blasting Rocks, by means of Galvanic Ignition.

Communicated by ROBERT HARE, M. D., Professor of Chemistry in the University of Pennsylvania.

I have observed various accounts in the newspapers of workmen killed or dreadfully lacerated by the blasting of rocks.

This, and many like occurrences will, I presume, create sufficient interest in the following communication, to justify its appearance in the Journal of the Franklin Institute.

I have ascertained that by a new application of galvanism, rocks may be riven with less danger than that which attends the firing of a pistol. I was induced to attempt this improvement in consequence of an application by a patentee (Mr. Moses Shaw,) for assistance in perfecting his patented mode of blasting rocks, by an electrical discharge from a Leyden jar.

In a letter dated June 1st, 1831, he says, "I have been engaged in blasting rocks by means of a fulminating powder, introduced into several cavities, and ignited in all of them simultaneously, by a spark from an electrical machine, by which means masses of a much larger size, and of a much more suitable shape, for any object in view, may be procured, than by the old plan. I have, however, to lament my inability to succeed in this method of blasting, during a great part of the year, when, in consequence of the unfavourable state of the weather, the ignition cannot be effected by electricity in any mode which I have devised, or which has been suggested by others, although I have consulted all the best informed professors to whom I have had access."

It occurred to me, as soon as this statement was made by Mr. Shaw, that the ignition of gunpowder, for the purposes he had in view, might be effected by a galvanic discharge from a deflagrator, or calorimotor, in a mode which I have long used in my eudiometrical experiments to ignite explosive gaseous mixtures. This process is free from the uncertainty, which is always more or less attendant upon the employment of mechanical electricity, for similar purposes.

The expectation thus arising, has since been fully verified. I have ignited as many as twelve charges of gunpowder at the distance of

one hundred and thirty feet, from the galvanic machine employed This distance is much greater than is necessary to the safety of the operator, as the deflagrator may be shielded so as not to be injured by the explosion, and by means of levers and pulleys it may be made to act at any distance which may be preferred. There is no limit to the number of charges which may be thus ignited, excepting those assigned, by economy, to the size of the apparatus employed.

These remarks have reference to the principal and highly important object of Mr. Shaw's project, which is to ignite at once a great number of charges, in as many perforations so drilled in a rock, as to co-operate simultaneously in the same plane. By these means it is conceived that the stone may be separated into large prismatic, or tabular masses, instead of being reduced to irregular fragments of an inferior size. The object to which I propose now to call attention more particularly, is a modification of the common process of blasting by one charge, which renders that process perfectly safe.

This part of the subject I shall introduce by premising, that almost all the accidents which have taken place in blasting rocks, have occurred in one of the three following modes:—

1st. The explosion has taken place prematurely, before the operator has had time to retire.

2nd. A premature explosion has ensued from a spark produced by the collision arising from ramming into the perforation, containing the powder, the brickdust, or sand, or other matter, employed to close it.

3d. The fire not reaching the charge after the expiration of a period unusually long, and the operator returning to ascertain the cause of the supposed failure, an explosion ensues when he is so near as to suffer by it, as in the instance near Norristown, published some years ago.

The means of communicating ignition, to which I have resorted, are as follows:—

Three iron wires, of which one is of the smallest size used for wire gauze, the others of the size (No. 24,) used by bottlers, are firmly twisted together. This is best accomplished by attaching them to the centre of the mandril of a lathe, which is made to revolve while the other ends of the wires are held by a vice, so as to keep them in a proper state of tension. After being thus twisted, a small portion is untwisted, so as to get at and divide the larger wires by means of a pair of nippers. In this way the smaller wire is rendered the sole mean of metallic connexion between the larger ones. These are tied in a saw kerf, so made in a small piece of dogwood as to secure them from working, which, if permitted, would cause the smaller wire to break apart. At one end, the twist formed of the wires is soldered to the bottom of a tin tube of a size to fill the perforation in the rock to such a height as may be deemed proper. This tube being supplied with gunpowder, the orifice is closed with a cork, perforated so that the twisted wire may pass out through it without touching the tube at any point above that where the finer portion alone intervenes. To the outside of the tube, a copper wire, about No. 16, is soldered, long enough to extend to a stout copper wire proceeding from one of the

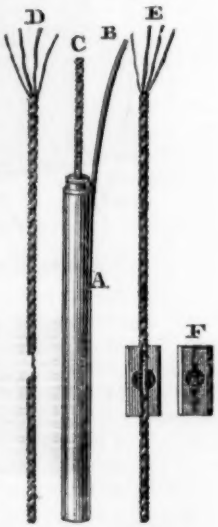
poles of a galvanic deflagrator or calorimotor. The wire passing through the cork from the inside of the tube, is in like manner made to communicate with the other pole. The connexions between the wires and the poles, should be made by means of soft solder, previously to which we must imagine that the tube has been introduced into a perforation made for its reception in a rock to be blasted. The tin tube may be secured within the rock by the usual method of ramming in brickdust or sand, by means of a plug, having holes for the protection of the wires of communication already described.*

The apparatus being thus prepared, by a galvanic discharge, produced by the movement of a lever through the quarter part of a circle, the finer wire is ignited, in the place where it intervenes solely in the circuit, so as to set fire to the surrounding gunpowder.

As the enclosure of the gunpowder in the tube, must render it impossible that it should be affected by a spark elicited by ramming, as no means of ignition can have access to the charge besides the galvanic discharge; and as this can only occur by design, without an intention to commit murder or suicide, or by unpardonable neglect, it is inconceivable that an explosion can take place in this method of blasting, when any person is so situated as to suffer by it.

It must be obvious that in all cases of blasting under water, the plan of a tin tube, and ignition by a galvanic circuit, must be very eligible.

At A is represented a cylinder or tube of tinned iron, replete with gunpowder. At C, the twisted wires are represented as they protrude from the cylinder through a cork, by which the latter is closed at the upper end. The other ends of the wires are soldered to the metallic disk which forms the bottom of the cylinder. D represents the twisted wires as they appear when all the larger ones are cut, the smaller wire still uniting them. F represents the piece of dogwood, duly prepared; and E the wires as when supported by the wood. The reader has only to imagine the hole in the wood, to be supplied with the fulminating composition, and covered by a fillet of paper or cloth, glued or pasted around the wood, in order to complete his conception of the wires as finally accoutred and situated within the cylinder A.



Besides affording support to the larger wires, and thus protecting the smaller wire uniting them from fracture, the piece of dogwood which has been described, by means of the small hole represented in it, serves to hold, and to preserve in contact with the lit-

* It has occurred to me that plaster of Paris might be used advantageously, as it would require no ramming, and might set with sufficient firmness.

tle wire, some fulminating powder. This not only facilitates the incipient ignition of the contents of the cylinder, but must make it extend more rapidly throughout the mass, and must, of course, cause it to be more powerful. Metallic arsenic, and chlorate of potash finely powdered and mingled, make an excellent explosive powder for this purpose; being more ready to explode from heat, and less so from other causes, than fulminating silver or mercury. Sulphur may be used in lieu of arsenic. Yet the use of these is not necessary, as the gunpowder will take fire directly from the wire, at least as effectually as in the usual mode.

Description of a Galvanic Machine, for producing ignition in Rock Blasting.

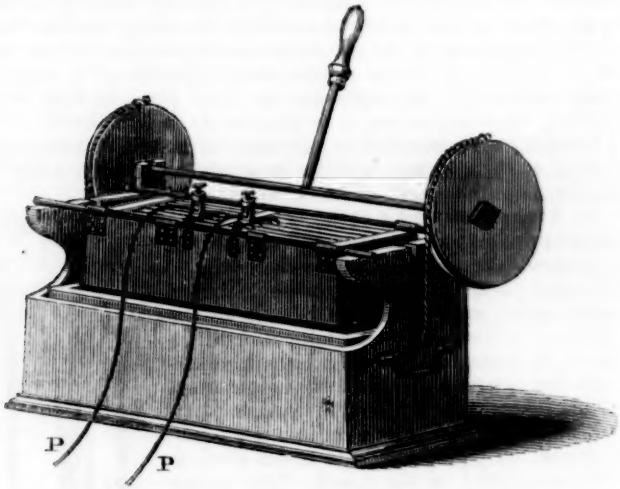
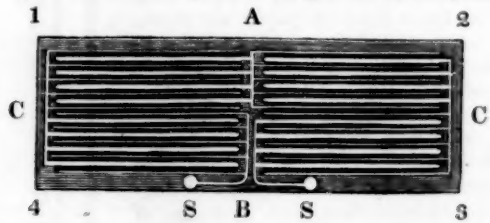


Diagram illustrating the arrangement of the plates.



This machine consists of sixteen plates of zinc, and twenty plates of copper, each twelve inches by seven, arranged in four galvanic

pairs. The plates are supported within a box with a central partition of wood, A B, dividing it into two compartments. Each of these may be considered as separated into two subdivisions by four plates of copper between the letters C C. Of course the box may be considered as comprising four distinct spaces, No. 1, No. 2, No. 3, and No. 4. The circuit is established in the following manner. Between the zinc plates of compartment No. 1 and the copper plates of compartment No. 2, a metallic communication is produced, by soldering their neighbouring corners to a common mass of solder with which a groove in the wooden partition between them is filled. With similar masses of solder, two grooves severally made in the upper edges of each end of the box are supplied. To one of them, the corners of all the copper plates of space No. 1, and the zinc of space No. 4, are soldered. To the other, the zinc plates of space No. 2, and the copper plates of space No. 3, are soldered in like manner. Lastly, the zinc plates of No. 3 are connected by solder in a groove, and the copper plates of No. 4 are in like manner connected by solder in another groove. Upon the ends, S S, of the solder just mentioned, the gallows screws are severally soldered, and to these the rods, P P, called poles, are fastened.

Rationale.

The zinc and copper surfaces of No. 1 and No. 2, communicating, have their naturally opposite electric powers exalted, and induce in the plates with which they are alternated, a like exaltation, still higher. By the communication of the latter with the surfaces in No. 3, and No. 4, a similar effect is induced, and again by induction the electric powers of the plate alternating with those last mentioned are augmented. Hence a discharge between the latter will have a quadruple intensity, and hence the poles, or rods, communicating with the gallows screws, soldered as above described to the zinc and copper plates last mentioned, will make a discharge through any conductor whenever the apparatus is put into operation by raising the acid, so as to enable it to surround and act upon the galvanic surfaces.

When, agreeably to the project of Mr. Shaw, several masses of gunpowder are to be simultaneously ignited, in as many different holes in the same rock, I purpose to introduce into each hole, a cylinder prepared as here represented; to secure them by ramming into the hole, sand, brickdust, or other suitable matter, through which the wires are allowed to pass so as to project on the outside. All the wires corresponding with that represented at B in the engraving are then to be soldered to a rod proceeding from one pole to a calorimotor; and all those corresponding with C to another rod proceeding from the other pole. In case the calorimotor cannot be placed at a sufficient distance to secure it from injury, it may be shielded by a strong cover. Under this, the *operator* might be protected; but if it be not convenient to have the shield large enough for his protection, a cord may be resorted to, which being attached to the lever of the machine, and made to pass through one or more pulleys, will enable

him to cause the acid to act upon the plates, at any distance which can be desirable.

It can scarcely be necessary to point out that the method of communicating ignition described here for the purpose of rock blasting, may be applied as the means of exploding a mine. As, for instance, the mines associated with the fortifications erecting near Newport, as a part of the means of annoyance, might have a communication through copper wires with a galvanic apparatus in those situations to which the beseiged might be expected to retire, putting it thus completely in the power of the commanding officer, to select that time for the explosion when its effects would be most serviceable.

Apparatus for transferring a liquid from a carboy, or cask, to bottles; especially useful in the case of sulphuric acid, the decanting of which is always more or less dangerous to the manipulator, especially as detached globules may reach the eyes.

By ROBERT HARE, M. D. Professor of Chemistry in the University of Pennsylvania.

By means of a treadle T, the rod R, and platform P, the bottle is, by the foot, pressed against a brass disk D, coated with gum elastic. In the centre of this disk are two holes, one of which receives a leaden tube communicating with an exhausting syringe S, while into the other hole another tube is soldered, which extends to the bottom of an adjoining carboy of sulphuric acid. By means of

the syringe, the bottle being exhausted, the contents of the carboy are forced into it by atmospheric pressure.

The gum elastic being stretched over the disk, is secured by a clasp which is fastened round the periphery by a screw.

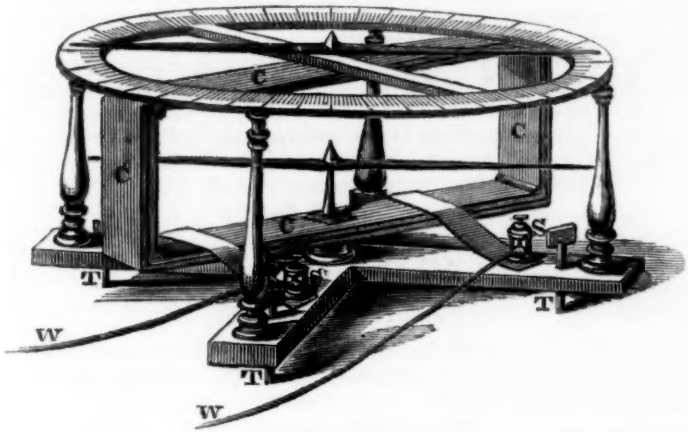
This apparatus may be employed to raise liquors into a bar room, from casks in a cellar, with this advantage over the pump now used for that purpose; that the liquor does not pass through a pump. It has only to come into contact with a pipe of from one-fourth to three-eighths of an inch in bore.

The attachment to the cask is easily made by a gallows screw soldered to the nozzle of a cock, or simply to a ferule which may be driven into a cork hole, punching the cork before it.

The foaming of fermented liquors would be promoted by the exhaustion, lessening, for a time, the atmospheric pressure on the carbonic acid.

Improved Galvanometer or Multipher, of an unusually large size.

By ROBERT HARE, M. D. Professor of Chemistry in the University of Pennsylvania.



This engraving represents a large multipher, or galvanometer, the needles of which are each about eighteen inches in length. The instrument is furnished above with a circle graduated into 360 degrees. Agreeably to the usual construction, the needle being within, the coil is subjected both above and below to the concurring influence of a current passed through the coil. In this predicament is the lower needle in the adjoining figure. When a needle is situated outside of the coil like the upper one in this figure, the influence of the lower portion of the coil, so far as it operates, must counteract that of the

upper one. Yet when the lower portion of the metallic coil is at a distance from the upper portion of about one-third of the length of the needle, and this is situated very near to the upper portion as here represented, the influence of the latter may so far predominate as to render the indications very nice; while they are as much more easily seen and estimated by means of the graduated circle, when, as in the situation of the upper needle, nothing intervenes between it and the eye.

In another instrument of the same dimensions I have used only a semicircle for the graduations, which, excepting the appearance, answers as well.

In lieu of wire, a coil of tin foil of about an inch in breadth and eighty feet in length, separated by thin paper, may be used, but a copper wire of No. 16 and of about 180 feet in length, coated with shell lac varnish, will be more efficacious.

The coil of tin foil or varnished copper wire, is wound about the parallelogram C C C C. The ends of the coil are severally soldered, or screwed, under the basis of the gallows screws S S.

When both needles are placed upon the pivot at the same time by the repulsion of their similar poles, they will diverge from the meridian unless they be in a reversed situation, in which case they will both appear as in the engraving, the north pole of one pointing north, the north pole of the other needle south. When, under these circumstances, a discharge is made through the surrounding coils, the consequent movements are very striking.

The clean surfaces of disks of zinc, and copper, each an inch in diameter, separated by paper moistened with pure water, are sufficient to move the needles sensibly. The wires W W are used for the purpose. They are attached to the instrument by gallows screws S S.

The level of the machine is preserved by the aid of four screws, of which only three can be seen in the drawing at T T T.

The Girard College.

ADDRESS

By Nicholas Biddle, Esq.

Chairman of the Trustees of the Girard College for Orphans; pronounced by request of the Building committee, on the occasion of laying the corner-stone of the edifice, July 4th, 1833.

(Concluded from p. 154.)

They would much err, who, comparing this institution with any ordinary standard, regard it as an Alms House, or a Poor House, in which a certain number of pauper boys housed together, to be kept from harm, are to receive some hasty rudiments of instruction, and then to be thrust out on the world to make way for a similar swarm of unfortunate children. By no means. The comprehensive benevolence of Girard looks to higher and better things. It is not a poor school, nor a charity school, nor a free school, in their ordinary acceptation. It is, as he denominates it, a "college." The peremp-

tory prohibition that "no distinctive dress should ever be worn," reveals his purpose that these youths shall not be designated as objects of remark or contempt by their contemporaries, that they shall be distinguished only by their conduct, and shall not wear the livery even of charity. The instruction, too, required, is of the highest character, embracing almost every thing worthy of being studied in the circle of human knowledge. "They shall be instructed," says he, "in the various branches of a sound education, comprehending reading, writing, grammar, arithmetic, geography, navigation, surveying, practical mathematics, astronomy, natural, chemical, and experimental philosophy, the French and Spanish languages. (I do not forbid, but I do not recommend the Greek and Latin languages;) and such other learning and science as the capacities of the several scholars may merit or warrant."

This excludes nothing—nay, it embraces every thing necessary to form a well educated man. How far this institution is to be carried—whether when the degrees of talent and disposition come to be analysed, some are to be instructed up to the point of their appropriate capacity, while the more intelligent and more diligent are to be carried into the higher regions of science, are questions of future administrations to be decided by experience. But it is manifest that all the means of education, thorough, perfect education, are to be provided, that every facility for the acquisition of knowledge should be at hand; nor is there any reason why the Girard College—liberally endowed beyond all example—should not be superior to any existing establishment, in the talents of its professors, or the abundance of its means of instruction, and, with the blessing of God, so it shall be. There shall be collected within these walls all that the knowledge and research of men have accumulated to enlighten and improve the minds of Youth. It will be the civil West Point of this country, where all the sciences which minister to men's happiness, and all the arts of peace may be thoroughly and practically taught. Its success will naturally render it the model for other institutions—thus, not merely accomplishing the direct benefit of those to whom its instruction extends, but irradiating by its example the whole circumference of human knowledge.

To this intellectual cultivation, will be added that without which all instruction is valueless, and all learning the mere ability for evil—that moral discipline which makes men virtuous and happy at their own firesides. "My desire is," says he, "that all the instructors and teachers in the college shall take pains to instil into the minds of the scholars, the pure principles of morality, so that on their entrance into active life, they may, from inclination and habit, evince benevolence towards their fellow creatures, and a love of truth, sobriety, and industry." When this harmony between the heart and the understanding ceases, mere knowledge is a curse, and men become intellectual statues, with the perfect forms of manly exterior, but cold, and selfish, and worthless, to the community which endures them. Our youth, too, will not fail to be deeply imbued with that enthusiastic devotion to republican government, and that knowledge

of his public rights and duties which should form the basis of the American character. It is thus that the founder strictly enjoins "that by every proper means, a pure attachment to our republican institutions, and to the sacred rights of conscience as guaranteed by our happy constitution, shall be formed and fostered in the minds of the scholars."

Nor need there be any dread that such an education will disqualify them for their pursuits in after life. In this country all pursuits are open to all men, nor need the humblest citizen despair of the highest honours of the republic. They err who suppose that because men are instructed, they may desert the ordinary walks of employment. There never can be such an over education of the mass of the people. Men labour not for a want of knowledge, but for want of bread. The cultivation of the mind, like the cultivation of the soil, only renders it more productive, and knowledge becomes the best auxiliary to industry by rendering the labourer more intelligent, and more ambitious to excel. The youths thus instructed will go forth into the various pursuits in life, many of which are in their nature mechanical; but they will begin with the disposition and the power not merely to excel in them, but to rise beyond them, and they will emerge from their workshops, as their countrymen Franklin, and Rittenhouse, and Godfrey, and Fulton, did before them, reaching all the distinctions of the state which may be honourably won by talents and character.

That the scene of so many blessings may be appropriated to them, it is intended to make this structure worthy of its great object, worthy of the name of its founder, and of the city which he was so anxious to embellish. Among the sciences most needed in this country, where individual wealth is hastening to indulge its taste, and where every state, and city, and county, requires extensive public buildings, is architecture. Indispensable in the rudest forms of life, it becomes the highest ornament of the most enlightened. In every stage of its progress, the style of its public works displays the character of the nation which rears them. Disproportioned and grotesque among a coarse and unlettered people: in nations more advanced, often over ornamented with the gaudy profusion and the caprices of tasteless wealth; it is only when sustained by the public spirit of a community at once enlightened and generous, that architecture attains its highest glory, a refined simplicity. Of that perfection, it is proposed that this structure shall present a model, the equal at least of similar works in any other country, and not unworthy of the best days of antiquity, a structure which will at once gratify the honourable pride of every citizen of the United States, and form the best study for all the branches of industry connected with architecture.

The enjoyment of so many advantages devolves on us, fellow citizens, the duty of great care and vigilance to preserve them.

After bestowing upon our city this rich inheritance, Girard adds this emphatic declaration. "In relation to the organization of the college, and its appendages, I leave necessarily many details to the Mayor, Aldermen, and citizens of Philadelphia, and I do so with the

more confidence, as from the nature of my bequests, and the benefit to result from them, I trust that my fellow citizens of Philadelphia, will observe and evince special care and anxiety in selecting members for their City Councils and other agents."

That the generous confidence with which he has thus committed to us the execution of his great designs, should never be betrayed, we owe equally to the name of the founder, and to the interests of our posterity, as the whole value of this institution will depend entirely on the administration of it. For myself and my colleagues to whom the high honour has been assigned of sharing in that administration, I can only say, fellow citizens, that we have assumed the trust with the deepest sense of its responsibility, and a determination to execute it in the spirit of enlightened benevolence which animated the founder, and we shall in our turn retire from it, with the hope that our fair city may always find successors, who, to equal zeal, add greater ability to serve it.

Under such auspices, we confidently trust that all the expectations of the founder will be realized. With this delightful anticipation, we now invoke the blessing of God on this great undertaking.

In the name of *Stephen Girard, of the city of Philadelphia, and commonwealth of Pennsylvania, Merchant and Mariner,* we lay the foundation of this *Girard College for Orphans.* We dedicate it to the cause of CHARITY, which not only feeds and clothes the destitute, but wisely confers the greatest blessings on the greatest sufferers;

To the cause of *education,* which gives to human life its chief value;

To the cause of *morals,* without which knowledge were worse than unavailing; and, finally,

To the cause of our *country,* whose service is the noblest object to which knowledge and morals can be devoted.

Long may this structure stand, in its majestic simplicity, the pride and admiration of our latest posterity; long may it continue to yield its annual harvest of educated and moral citizens to adorn and to defend our country. Long may each successive age enjoy its still increasing benefits, when time shall have filled its halls with the memory of the mighty dead who have been reared within them, and shed over its outward beauty, the mellowing hues of a thousand years of renown.

The College is located on a tract of land containing forty-five acres, formerly known by the name of Peel Hall, situated on the Ridge Road, one and a fourth miles from the city. This estate was purchased from Mr. William Parker, by Mr. Girard, a short time before his death, for the purposes of the College.

The building is peripterial, being 160 feet front, by 217 feet on the flank, including the porticoes.

The columns are six feet in diameter at the base, and fifty-four feet six inches high, including capitals and bases.

The order is Grecian Corinthian, from the monument of Lysicrates, or Lantern of Demosthenes, at Athens.

The superstructure reposes on a casement, in the form of a truncated pyramid, composed of twelve steps surrounding the whole building. The passage between the columns and the wall of the cell is fifteen feet.

All the columns, entablature, and pediment, are to be composed of white, and the cell of light blue marble. The floor, and stairways, are also to be composed of marble.

The vestibules are each twenty-six by forty-eight feet; they are ornamented with sixteen rich Ionic columns, antæ, and entablature, supporting a ceiling embellished with lacunari.

Each story contains four rooms fifty feet square in the clear. The two rooms across the south end of the first story, are divided from each other by marble columns, and entablature of the Corinthian order, so that they may be used as one room, for the purpose of exhibitions, &c.

The whole building is to be heated by means of furnaces placed in the cellar.

The college is located parallel with the city streets, fronting the south. The land at the base of the building is twenty-six feet above the reservoir on Fair Mount. The whole height of the edifice is ninety-seven feet, making the elevation of the roof 123 feet above the said reservoir.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN APRIL, 1833.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the *Paddle Gate*, for canal locks; Earl Trumbull, Little Falls, Herkimer county, New York, April 4.

The contrivance here patented is denominated a radiating paddle gate. It is in form like the valves sometimes used in the ash pits of stoves to regulate the draft. There may be two or more arms turning on a centre, and covering corresponding orifices cut in the lock gate. In order to open or close the paddle, a rod attached to the extremity of one of the arms, extends up to the top of the gate, where it is acted on by a lever. The gate is intended to be of cast iron, and is to increase in thickness as it narrows in approaching the centre. In one used for experiment, the circle of the centre was between four and five inches in diameter; the paddle gate seven and a half feet in length, and the ends of the wings fourteen inches wide.

The claim is to the radiating paddle gate, and its application to canal locks, &c."

2. For a mode of *attaching Soles to Boots and Shoes;* Saml. D. Breed, city of Philadelphia, April 4.
(See specification.)

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3. For an improvement in the *Still;* John Wright and David Polley, city of New York, April 4.

The specification of this patent is not a very excellent production in a literary point of view; a circumstance, however, which might be passed over as one of little importance, were the description clear, and the claim definitive; but the former is obscure, and the latter not to be found. Various tubes and cocks are noticed, and also a "goose" "in the shape of an egg," which is a reservoir intermediate between the still and the worm, or refrigerator. A tube rises from the still head, and passes into the body of the goose, where a partial condensation into low wines is to take place, which low wines are allowed to run back through the "low wine pipe" into the still, the higher spirit passing, from another tube in the body of the "goose," into the worm. The patentees, speaking of the description, and the accompanying cut, &c. "pray [that they] may be considered as documents explanatory of the subject, and worthy of a benign and favourable construction."

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4. For an improvement in the *Plough;* Henry Peachy, city of Washington, District of Columbia; an alien, who has given notice of his intention to become a citizen of the United States. April 5.

The object of this, so called, improvement, is to lessen the friction of the earth against the mouldboard in turning the furrow slice over. With this view the middle part of the mouldboard is made completely round, and allowed to revolve upon gudgeons; the upper gudgeon working in the frame work of the beam, and the lower in the sole of the plough. This revolving part is sketched in the margin.

Such an *improvement*, we are convinced, will be worse than useless, as but a very small portion of the revolving part can be exposed to the action of the sward as it is turned up, without bringing the slice too abruptly against it; but apart from this and other objections, the dust will soon insinuate itself between the revolving and the stationary parts, and put a final stop to the revolution. "The discovery and invented improvement claimed, is the principle and application of a cylinder, or cylinder roller, or rollers, wheel or wheels, in the construction and making the *revolving mouldboard plough.*"

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5. For a *Corn Sheller;* Samuel Donnell, Greensborough, Guilford county, North Carolina, April 5.

This corn sheller acts upon the same principle with that first patented, thirty years ago, which consisted of a cylinder set with spikes, made to revolve in a concave borne up by springs, between which cylinder and concave, the corn was shelled. In the present instance,

instead of spikes, rods or ribs of iron are to be nailed along the cylinder, at suitable distances apart. The lower part of the concave, borne up by springs, is formed of slats placed at such a distance apart as shall retain the cobs, but allow the corn to pass through. The patentee avers "that of the above described machine all and every part is new except the cylinder, and on it there is an improvement by having the iron rods nailed straight with it."

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6. For an improved mode of *Constructing Vessels;* Commodore James Barron, U. S. Navy, city of Philadelphia, April 5.

The object of this improvement is to construct vessels which cannot be sunk, even if filled with water. Their buoyancy is to be the result of the quantity of material of a less specific gravity than water which enters into their composition, and which is to be such that it will compensate for the absolute weight of the metallic, or other ponderous articles on board.

In building, the first log laid may be the keel, and upon this a tier of logs is to be laid crosswise, and above these a tier lengthwise; proceeding thus with layers of logs which alternately cross each other, until a solid bottom of sufficient thickness has been formed. The logs are to be secured together by strong treenails, and it is recommended to give to each of them a complete coating of turpentine and tallow before laying them.

When this solid part has been completed, and the desired model formed, a rebate is to be made all around it, by cutting two or more inches inwards, and two or more feet downwards. The timbers, or ribs, to form the upper works are then to be let in flush with this rebated part, by cutting into the solid timber. A thickness will thus be left for the lower edge of the lower plank.

The wood to be used in constructing the solid parts of such vessels, is white pine, hemlock, poplar, or others, which have a specific gravity of about four-tenths that of water; the result of which will be that the solid part of the hull, if placed alone in the water, would float with six-tenths of its substance out of that fluid.

The advantages possessed by such vessels, as stated by the patentee, are, their adaptation to the purposes of war, as they cannot be sunk by gunshots. It is also remarked that they will possess many advantages for sea packets, bomb ketches, steam batteries, and gun boats, and likewise for steam vessels on the western waters.

The claim is to "the arrangement and construction of the several parts of the vessel, with solid logs, pinned or bolted together as before described; so as to make it incapable of immersion, and sufficiently strong to resist shocks; whether applied as a vessel of war, a merchant vessel, a steam vessel, or a life boat: but I do not claim the shape of the vessel, nor any of the parts, or their arrangement, now in use. I also claim constructing the sides of vessels with logs, in cases where it may be desired."

We heard a gentleman of the navy object to this mode of construction for vessels of war, that hot shot would lodge in, instead of passing through, the solid timbers, as they do in ordinary vessels, and that,

consequently, the danger of burning them would be greatly increased; this objection, however, we do not think a valid one, as there can be no combustion without a draft of air, which would be prevented by the solidity of the bottom. For steam-boats on the western waters we do not think the plan would answer, as these boats are intended principally for the conveyance of freight, and require all possible room for its stowage.

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7. For a *Canal Boat;* Ezra Reed, Pottstown, Montgomery county, Pennsylvania, April 6.

This canal boat is to be built in parts, or sections, each having its four sides, and bottom. Of these sections there may be six, or more; the two forming the stem and stern may differ in shape from the others, which may be nearly, or quite, alike.

The separate parts are to be united by two pieces of plank on each side, extending from stem to stern, fastened by spikes, or bolts, to the bow and stern sections; the intermediate ones to be kept in their places by chains.

The advantages contemplated are, saving of cost in construction; greater strength and durability; less specific gravity than other boats, and consequently a greater capacity, or burthen. The claim is to "the division of canal boats into parts, or sections, and uniting them in the manner, and for the purposes described."

If any of the contemplated advantages are realized, it certainly will not be the result of the principles assumed. *Less specific gravity!* The writer of the specification certainly does not know what specific gravity means, or he would not have used the term as he has here done. His boat, unloaded, will sink deeper into the water, than an ordinary canal boat of the same dimensions, because its absolute gravity, or weight, will be greater. Suppose it to be in six sections, there are five double ends at the junctions, employing a large quantity of timber, increasing the weight, and diminishing the room; all which is to augment the capacity, and to render the article cheap.

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8. For *Tempering Currier's Knives;* Daniel S. De Lano, Cornwall, Litchfield county, Connecticut, April 6.

This improved mode of tempering, consists in hammer hardening. Hear ye! "What I claim in the above, as my discovery, is the art of producing a proper temper for said knife, by the process of hammering."

There is not a smith in the country who is not acquainted with the process of hammer hardening. Whether it has ever been the practice to depend upon hammer hardening in curriers' knives, we are not informed; but are of opinion, however, that the kind of temper and texture wanted on the edge of such a knife, will best be obtained by hardening and tempering in the usual way, and afterwards condensing the steel by hammering.

9. For *Punching, Cutting, and Slitting Iron, and other Metals;* John V. Buskerk, Norwalk, Huron county, Ohio, April 6.

This machine is nothing more than the lever press, made in the form which the patentee has preferred, or happened to hit upon. He has described all the parts with much care, without designating any one as new, and therefore concludes without making any claim. The machine is highly spoken of by him, as working well and very advantageously, which we do not doubt; but we have seen many such, to which his, we apprehend, would not in any respect be found superior, and from some of which it scarcely differs in form.

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10. For an improvement in *Saw Mills;* Thomas M'Carty, Elmira, Tioga county, New York, April 8.

This patent is taken for what is denominated a "self-setting saw mill," which name it derives from its having slides on the head and tail blocks, which are so operated upon by machinery moved by the action of the mill itself, as to set the log, after it has been properly slabbed, gauging it at each end to any required thickness. The gates for backing the log, and for other purposes, may also be opened and closed at the proper time, by apparatus explained in the specification.

The parts claimed are, the slide on the head block; the mode of moving the slides by levers and weights; the hoisting of the gates by the action of the mill, and also the mode of closing them. The patentee adds, "In fine, I claim the invention of a self-setting saw mill, that is, the setting of the log of its own accord to saw lumber from one-fourth of an inch, to three inches thick."

The latter part of the claim cannot have the effect of preventing others from constructing self-setting saw mills, provided they do not trench upon what may be new in the patent before us, as it cannot forestall future invention. Some of the particular claims of the patentee also, can only be sustained upon the modes which he has adopted, as the same things have been done before; the closing of the gates, and the backing of the log, every one acquainted with such machinery knows to be operations common in saw mills.

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11. For a mode of *Applying Wind to Musical Instruments;* Peter L. Grosh and George Grosh, Lancaster county, Pennsylvania, April 8.

The wind supplying part of this apparatus consists of two pair of bellows, so connected together as that they may act concurrently. They are to be placed one under each arm, and worked in the manner of those used for bagpipes. The patentees allude to a musical instrument of their invention which they denominate an EUPHONIAD, to which this mode of blowing may be applied, the instrument being held upon the knees; this instrument is not patented, and a description of it was not, therefore, deemed necessary, but the patentees say that "these bellows may be applied to other instruments of music." Not being informed of the construction of the Euphoniad, we are unable to

form any judgment of the advantages which these bellows may possess in playing upon it, but if they are not specially calculated for that instrument, we do not know to what other use they stand any chance of being applied.

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12. For a *Machine for Cutting Sausage Meat;* Lewis Bayha, and Frederick Rapp, Wheeling, Ohio county, Virginia, April 8.

Knives are fixed on the ends of pieces of timber which are raised vertically by means of cams, or lifters, projecting from a revolving cylinder. The meat is placed upon a log or block, which forms the bottom of a trough for containing it. From the revolving shaft of the lifters, and by means of a shaft and bevil wheels, motion is communicated to the block containing the meat, which being thereby moved backward and forward, causes the knives to cut on different parts.

The claim is to "the before described machine; particularly the cylinder with the pegs or projections placed spirally for moving the arms; and the segment wheel, working the racks that move the carriage backward and forward." If a claim cannot be sustained to the general arrangement of the machine, which has but little novelty, it certainly cannot to the "cylinder with the pegs," and "the segment wheel," that has none.

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13. For a *Perpetual Still;* Simon Emery, city of Philadelphia, April 9.

Although the specification of this patent is drawn up with much care, the drawing, or sketch, to which it refers, is in many instances without the letters and numbers employed in the reference; we were able, it is true, to designate the parts intended, but still the omission is not one of trifling consideration.

We cannot, without the drawings, explain the construction and arrangement of the various parts, and shall not therefore make the attempt; especially as there are some things stated which we do not fully comprehend. If the advantages which are said to result from the use of this still, are not very greatly overrated, it must, assuredly, be a very valuable invention; these advantages are the saving of two-thirds of the cost in the first instance, compared with any other still capable of producing the same quantity of equally good spirit in the same time. The economy of fuel, a saving of three parts out of four being made. The saving of time in charging and discharging. The superiority of the products. The producing of more from a fifty gallon still of this construction, than from one of 300 gallons of any other kind.

The claims embrace a number of different items, most of which would require the drawings for their explanation.

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14. For an improved method of *Working the Levers of Fire Engines;* Samuel Huse, Newburyport, Massachusetts, April 9.

(See specification.)

15. For a *Thrashing Machine;* John R. Wheeler, Brighton, Monroe county, New York, April 9.

This is called an *intersecting cylinder thrashing machine*, and it has the rare merit of differing entirely in its construction not only from the great mass of those which have been patented, but, we believe, from the whole of them. We are not, however, prepared to speak with equal confidence of its superior utility, as upon this point we entertain strong doubts.

Disks of cast iron are to be made, which may be ten inches in diameter, three-fourths of an inch thick in the middle, tapering regularly on each side from the centre towards the edge, so as to form a feather edge. Each of the sides is to be furnished with angular grooves, or ridges, radiating from the centre to the periphery. A shaft is passed through holes in the centre of these disks, such number of them being put on as to form a cylinder of fifteen, or more, inches in length. Of these cylinders there are to be three, which are to be so mounted on their gudgeons as that the disks shall interlock without touching; the shafts occupying the position of the three angles of an equilateral triangle. The cylinders are to revolve with different velocities, and between them the straw to be thrashed is to be passed. We can very well perceive how the disks of two of the cylinders may interlock, but how those of the third one, behind them, is to do so with the two others we cannot very well understand; it appears, however, that some how or other it is to be done.

The specification is drawn up with some *show* of learning. There is much said about angles and triangles, and "two endless, inclined, circular planes, together with the planes subtending the acute angle which forms the eye on one side extended, gives the action required."

The claim is to "all the above," with the right to alter it in position, materials, &c. &c.

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16. For a *Process for the preservation of Wood;* Charles Morgan, Point Coupee, Louisiana, April 12.

The plan here proposed is to saturate the timber with lime. A cistern of sufficient dimensions, and of any material which will hold water, is to be constructed, and in this the timber is to be placed, taking care that there is a space between each of the pieces, and between them and the cistern. Rain, or river, water is then to be poured in, so as to cover the whole of the timber, to which enough quick lime is to be added to saturate the water. As the water evaporates, and as the lime becomes neutralized by carbonic acid, fresh portions of each are to be added.

The patentee says that from numerous experiments he has ascertained that timber of from one to four inches in thickness, may be saturated with lime in from six to twelve months; and that logs of a foot square may be prepared in from two to three years; and that the durability of the timber will be such as to cause it to last two, three, or more, times as long as it otherwise would.

A wash made of equal parts of lime, wood ashes, salt and molasses,

diffused in water, and applied to shingled roofs, two or three coats being put on, will, it is said, preserve them longer than oil paint.

There is no claim made, the saturation with lime being, it is presumed, considered as altogether new.

Since this patent was issued, the value of the process has been much extolled in the public papers; it is not, however, from these, but from the test of actual experiment, repeatedly tried, and long continued, that we are to learn its real worth. The process has been recommended upon theoretical considerations, it having been asserted that the dry rot is occasioned by an acid contained in the timber, and that this acid is neutralized by the lime; an opinion altogether gratuitous, and not justified by observation. Because the pyroligneous acid is obtained from wood by destructive distillation, it seems to be taken for granted that it existed there ready formed; a conclusion very natural to the uninformed, but very unsatisfactory to the chemist. We wish, more than we hope, that the plan may prove as effectual as the patentee believes it will be; but the known fact that the ends of timbers laid in lime mortar, are more subject to decay than any other part, is at variance, we think, with the doctrines which uphold the anticipations of its advocates.

Saturation with mineral poisons, such as the salts of copper, arsenic, and corrosive sublimate, have all been proposed as preservatives of wood, and the former was some years since made the subject of a patent in England, but we have never heard of it since. The corrosive sublimate has recently been much extolled, (see p. 208,) but, as with the lime, we should rely on time alone to teach us its real value. Oils and resins have also been employed for this purpose, but their use has not become established; indeed, from all we know, we are justified in saying that how we may effectually prevent the dry rot, is still a desideratum.

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17. For an improvement in *Fire Proof Chests and Safes;* James Gayler, city of New York, April 12.

The material employed in the making of these chests and safes is the same as that used in the chests imported from France, and others made in this country. But, in general, the chests are to be made double, in whole or in part, leaving a space filled with air between them; thus, for example, there are to be two doors, or lids, both of which must be opened to take articles from the chest.

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18. For *Backs for Smiths' Forges;* Timothy Bush, jr., Springport, Cayuga county, New York, April 12.

The patentee states that his forge back differs from all others before known, in having the part at the back of the fire made to shift, so that when impaired, it can be replaced without renewing the whole concern: and he concludes with saying that "the principal feature of this improvement consists in the movable or shifting section, through the centre of which the tew iron passes. This I claim, with the privilege of varying the proportion, &c. &c." By turning to the patent

of Frederick Avery, obtained on the 12th day of February last, it will be seen that the main design of the present patent has been anticipated more than once. Our notice of this subject will be found at p. 92 of the present volume.

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19. For an improvement in the *Boiler for Generating Steam;* Matthew T. Wallace, city of New York, April 12.

We have read the specification of this patent until we have become completely bewildered, from the want, as we think, of any thing specific in it, although it is by no means deficient either in length or repetition. There is a very well executed drawing annexed to it, but as there are no references made to it, it helps us out but little. From what we can collect, there are to be seven different fire places, each with its door, grate, and ash pit; and the fire, it seems, is to be surrounded by heaters, containing water, all of which communicate with the boiler above. This boiler, judging from the drawing, has a section something like that of the old Boulton and Watt boiler. That the reader may be able, however, to make some *guess* at the nature and extent of the improvement, which is all that we can do, we will present him with the points claimed.

"I claim the manner of bringing the mouth, or entrance into the heaters, out at the sides of the boiler.

"I claim the application of hinges to grates under fires in water boilers.

"I claim the construction of tubes passing round under the grates.

"I claim the manner of partitioning between the bottom of the boiler and the tubes (or the apron which encloses the grates) and between the grates; and of closing the spaces thus formed in front of the grates, by doors hung by hinges, so as to shut the air off of the grate when necessary.

"I claim the manner of constructing double boilers, so as to allow the person or persons who attend the fires in the heaters, to pass in and out under the top of the boiler where it connects the two, and between the boilers. Two or more boilers may be connected in a similar manner.

"I also, and more particularly, claim the principle and mode of applying heat by burning coal or wood, but more particularly coal, to the boiling of water in boilers constructed for generating steam, in, and by, *several separate small fires*, by means of the particular mode of construction and location of the said heaters. They being so located within the boilers, as to apply the heat as equally as possible to every part of the water within the boiler."

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20. For a *Reacting Water Wheel;* Israel S. Savage, Waterville, Kennebeck county, Maine, April 12.

This improvement consists in so constructing the reaction wheel as that the pressure of the water shall not cause it to bear on the lower gudgeon. "The invention here claimed consists in the rim,

or bottom, upon which the buckets turn for taking off the weight of water, and the mode of adjusting the height of the wheel by the screws and movable gudgeon."

The same object was attained by Calvin Wing, and his mode of doing it is described in the specification of his patent, vol. vii. p. 86, the apparatus used being denominated a lighter. In a patent obtained by John Turner, on the 18th of January, 1831, a similar contrivance is also described, and the same has subsequently been done in other patents.

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21. For *Washing Pulp in the manufacturing of Paper;* Francis Goucher, Chester county, Pennsylvania, April 12.

(See specification.)

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22. For a machine for *Shelling Corn;* Joseph Ross, Boundbrook, Somerset county, New Jersey, April 12.

The corn is to be put into a hopper, against the open end of which there revolves on its axis a sheller, set with spikes, which is in the form of a double cone, truncated, and joined together at its smaller ends. A concave is borne up against each of these cones, by appropriate springs, and between these and the cones, the corn is to be shelled, the grain falling through suitable openings, and the cobs passing off at either end. The chaff is to be blown away by a wind wheel. The claim is to the combination of the several parts of the machine, and particularly to the two frustrums of cones united in the centre; no separate part, with the exception of this, being claimed.

The machine, as represented, appears to us to possess one great defect, and this is in the feeding part; the corn is to be put into a hopper, and we see nothing to prevent its passing in endways instead of longitudinally, the only way in which the shelling can be effected.

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23. For an improvement in the *Revolving Platform used upon Rail-ways;* John Elgar, Civil Engineer, city of Philadelphia, April 12.

(See specification.)

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24. For a *Machine for Breaking Hemp,* Thrashing, Cutting Straw, &c.; Noah G. Hayden, Harrodsburg, Mercer county, Kentucky, April 12.

A horse is to turn a vertical shaft, having a large spur wheel on it, made in the usual way. The cogs of this wheel are to take into a trundle head, fifteen inches in diameter. The shaft of the trundle head is vertical, and from it are to project eight arms, each eight feet long, and made of three by four scantling. A heavy rim is to unite them at about two feet from their ends, and is, we suppose, to operate as a fly wheel. Knives, two feet in length, are to be attached to each of these arms, and are to cut straw; how it is to be fed to them, however, we are not informed. A platform is to be placed above the arms, and two or more break boards, for breaking flax, are also to

make a part of the machinery; these contrivances are, in some undescribed way, to break more hemp, or thrash more grain, than any other machine. There is no claim, and we may add, no explanation.

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25. For an improvement in *Clocks, consisting in Rolling Pinions, and Pinion Wheels;* Joseph Ives, Bristol, Hartford county, Connecticut, April 12.

The patentee does not pretend that the rolling, or revolving, of the wires, which are sometimes substituted for leaves in the pinions of wooden or brass clocks, is new, but he claims to have made an improvement in the mode of fixing them, the value of which, however, we are unable to perceive. The holes in which the pinions turn in the heads at each end, are to be drilled of such size as will allow the wire to revolve freely, without turning it down; or the holes may be drilled smaller, and pivots turned on the end of each wire. The information given amounts to no more than this.

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26. For an improvement in the *Striking part of Clocks;* Joseph Ives, Bristol, Hartford county, Connecticut, April 12.

This improvement consists merely in making the count wheel to revolve once only, instead of twice, in twenty-four hours; to do this, all that is necessary is to repeat the notches for each of the twelve hours; the ordinary number occupying but one-half, instead of the whole circumference of the count wheel.

We apprehend that in Italy, where it is the practice to mark from one to twenty-four upon their dial plates, their count wheels revolve but once in twenty-four hours.

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27. For a *Churn;* James Thorn, Clinton, Dutchess county, New York, April 12.

Two boxes are to be made in the form of square obelisks, with their apices truncated, and the two joined together at their truncations. These, when laid on their sides form the body of the churn, which is to be made to rock on pivots at the point of junction. There is an opening through which the milk is to be put in, and when the churn is rocked, this fluid runs through the tubular communication from one box to the other. An arched air pipe connects the boxes, above, to establish a communication between them, without which the flow of the milk would be obstructed.

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28. For a *Machine for making Spokes for Wheels;* Daniel H. Wiswell, Petersham, Worcester county, Massachusetts, April 12.

The tenons are to be cut by circular saws, and the rounding of the edges of the spokes to be effected by revolving cutters upon cast iron wheels with grooves in them, the cutters and wheels being adapted to the curvature to be given to the edges; the spoke is to be held upon a sliding carriage; this, and the other parts of the apparatus appear

to be judiciously arranged. Spokes made by such a machine will be precisely similar, and in many respects superior to those formed by hand.

"The invention here claimed consists of the whole of the before described machine, when taken together; particularly the wheel of cutters for dressing the edge of the spoke; but no claim is made to circular saws, the gearing, tenoning wheel, or other parts before described, taken separately."

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29. For a *Rotary Steam Generator for Cooking, &c.;* Hardin Branch, city of New York, April 12.

(See specification.)

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30. For a mode of *Taking Measure for Cutting Ladies' and Gentlemen's Clothing;* James Mendenhall, Westchester, Chester county, Pennsylvania, April 16.

There is so little complexity in the mode of taking measure for garments, in the plan here proposed, when compared with the "mathematical protractors," and the numerous other instruments which enrich the files, and embellish the shelves, of the model room in the patent office, as to admit of our looking into the subject, not, it is true, with the eyes of an adept, but with those of an amateur. The following is the proceeding described. A rod, or measuring stick, is to be placed on the floor, and a mark made on it at the top of the hip joint; after this, placing it in front of the candidate, the top of the coat is to be marked on it, and the distance between these two marks taken for the breast. The rod is then to be placed behind, and the length of the back taken to the same mark. A measuring tape is then to be passed round the back part of the neck, round the front part of the arms, and under them, till each end reaches the measure behind the neck. One-fourth of this measure is to be taken for sixteen, and one-half of this sixteen is to be divided into eight parts. The measure round the breast is then to be taken, and the difference between this measure and that round the arms is to be marked to obtain the breast of the coat. The "remainder of the measure is taken from the eight," in what way we are not told, but we suppose the profession will understand it; as to ourselves we find already that we have no claim to connoisseurship in the business. But to proceed,

The distance from the floor, behind and before, shows, we are told, the rounding or hollow of the back. Waistcoats, it is said, can be measured in the same manner as coats; and that, "in measuring for pantaloons, the distance from the arm pits to the hip joints, gives the exact seat;" a proportion of parts which is entirely new to us.

The next point noticed is one of great delicacy, namely, the "taking measure for ladies' garments, or habits." In doing this they are to be "taken round the arms;" and here we beg permission to drop the curtain.

The claim is to "the before described method of taking measure for garments, as distinguished from all the methods now in use."

31. For a *Water Wheel for propelling Steam-boats and other Vessels;* Daniel Holme, Bergen county, New Jersey, April 16.

The buckets of this wheel are not to consist of flat float boards, in the usual way, but are to be made in the form of scoops, having the back and sides enclosed; the form which they thus assume resembling that of the bricklayer's hod. It is proposed to make them of sheet iron.

The claim is to the "making the buckets close at the back and sides;" close buckets, such as are now in use for overshot wheels, are disclaimed, as not invented by the patentee.

For ferry boats, it is proposed to use double scoops, placed back to back, to enable them to pass equally well both ways.

The patentee ought to contrive some mode of obtaining a vacuum in his scoops, or there will be a perpetual conflict between the water and air contained in them, more especially when they are placed back to back.

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32. For *Tide and Current Water Wheels;* Amasa Dingley, of Winslow, and Israel S. Savage, of Waterville, Kennebeck county, Maine, April 16.

The proper frame work for supporting the water wheels, and other parts of the machinery, is to be erected upon a wharf or other suitable place, the mill house being on the shore, and the power obtained being communicated by shafts properly geared. There may be two or more water wheels, each having its proper gearing, so as to obtain their united effect. The water wheels are to be placed upon shafts which may be raised and lowered by means of a pinion and segment wheel, thus regulating their dip into the water.

"The invention claimed is the combination and arrangement of machinery, as described, by which the water wheels are made to work in the water at any required depth; also in conveying the motion to any required distance."

It was necessary for the patentees to limit themselves to the arrangement which they have described and represented, as tide and current wheels are in themselves no novelties, having been very frequently erected. The mode of construction shown in the drawings does not appear to hold out any promise of greater success than has heretofore resulted from similar plans, as it is not more simple, or in any way likely to be more efficient. In most instances tide and current wheels have been failures, as there are but few situations where more convenient and safe modes of obtaining power do not present themselves.

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33. For an improvement in the art of *Grinding Grain and other substances;* Dan Parmele and Isaac C. Shoemaker, Kingston, Luzerne county, Pennsylvania, April 16.

The thing intended to be patented is the mode of constructing a portable grist mill, with stones of two feet in diameter. The particular mode of forming the spindle and gearing would require a draw-

ing for its explanation, but the following outline will suffice for most of our readers. The spindle is to be made double, so that the upper and lower stones, placed upon it, may be caused to revolve in opposite directions. The lower stone is fixed on a hollow shaft, or box, through which the main spindle passes, and in which it turns freely; the upper stone being balanced on the main spindle. Below the stones there are two bevel-geared wheels, one of which is on the hollow shaft of the lower stone, and the other on the main spindle below it. These stand at such a distance from each other as to allow a bevel-geared wheel, upon a horizontal shaft, to mash into each of them, and thus to turn them in opposite directions.

The claim is to "the hollow spindle, being made in two parts for the purpose of preventing heat, and for the great convenience of attaching the other machinery to it. Also the convenience in levelling the lower stone; and by means of the joint in the spindle the surface of the stones working more accurately together without straining the spindle, or any part of the machinery. Also the facility with which four mills of the same dimensions may be run by the same cog wheel which carries one; and also the turning of both stones with a single belt."

As respects some of these claims, the ingenuity of the person who would carry them into operation, would be taxed to devise the mode of so doing, as they are not noticed in the body of the specification.

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34. For an improvement in the *Manufacturing of Shoes, Boots, or other covering for the feet;* Henry Whitman, Edmund Brown, and Stephen Brown, Norfolk, Litchfield county, Connecticut, April 16.

The point claimed as constituting this invention consists in tanning the skins, or hides, with the hair or fur on them, by putting them into a vat containing tannin, extracted from bark, in the usual way. The skins are then to be dressed on the flesh side, and made into shoes, boots, &c.

Although we have seen several processes for dressing, or preparing, skins with the hair on, we do not recollect that either of them consisted in the common process of tanning, yet when this was known it seems impossible that it should not be the first essayed; the patentees are fortunate, therefore, if they have not been anticipated. It seems a little difficult, also, to conceive how a process so simple could demand the joint talents of three persons to invent or discover it.

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35. For machinery for *Mortising Hubs and Felloes* for Wagons; J. Paullin, Dantown, Butler county, Ohio, April 17.

Two instruments are to be used in succession, the first of which is for boring the holes in the hub, in the places where the mortises are to be made. In this machine, the hub is to be fixed vertically upon a table, and held in its place between two uprights having a cross piece at top, forced down by wedges. Pins are to be inserted

into the centre of the hub, upon one of which pins a ratchet wheel is to be placed, having as many teeth on it as there are to be mortises, which by the aid of a pall, serves as a dividing plate. After two holes have been bored, one at each end of the mortise, by means of a bit fixed for the purpose, the hub is to be removed to the mortising machine, where it is fixed with its axis horizontal, and with a ratchet wheel as before. A pitman, or slide, working in a frame above it, is moved up and down by a crank operated on by a wheel and pinion. The lower end of the pitman receives the shank of the mortising chisel, which is to cut each mortise at one stroke. The cutting part is made in the form, and of the size, of the mortise; and is hollow, so that the chips may pass up through it.

The points claimed are the general arrangement of the machinery, and the method of using the ratchet wheel for dividing the hub.

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36. For an improvement in the *Bark Mill;* John Trash, Ahiman Seabury, and William Young, Sangerfield, Oneida county, New York, April 17.

This is to be a cast iron mill, turned by a vertical shaft in the usual way. The nut is a truncated cone, set with teeth, in a manner which is particularly described, and surrounded at its lower part, to the height of about six inches, by a hoop or curb, of cast iron, also set with teeth. From the upper edge of the curb, bars rise, which, passing up nearly to the surface of the revolving nut, unite together near the top of it, leaving between them an opening through which the spindle passes. A hopper surmounts the whole, and is divided into any convenient number of parts, say eight or ten, by vertical partitions, corresponding with, and standing over, the iron bars before described; these regulate the feeding of the bark.

The improvements claimed are the particular manner of setting the teeth; the omission of a rim, jutting, inwardly, over the winged teeth upon the hoop, or curb, and "in its operation, the great and essential improvement is the saving of power."

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37. For a *Lime Kiln;* Thomas H. Powers, Sodus, Wayne county, New York, April 17.

The kiln here described is to be oval at its base, measuring within eight feet by ten. The feeding arch is to be at one end, and over this the wall is to be built vertically, but at all other parts it is to slope out gradually, until, at the height of twelve feet, it is to terminate in a circular opening of twelve feet in diameter. The lime to be burnt is to be piled, or built up, within, so as to leave an opening like an oven, against the feeding arch. The filling is to be managed with much regularity, so as to leave a proper and equable draft, and the result is, according to the patentee, that "a kiln of dimensions sufficiently capacious to contain one thousand bushels of lime, may, in this way, be completely burned in forty-eight hours at farthest, and with ten cords of wood."

The whole kiln must be considered as new, there being no claim made.

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38. For an improvement in the mode of constructing *Vats and Leaches for Tanning;* John W. Moore, Roxbury, Delaware county, New York, April 18.

The vats are to be made in continuous rows in such a way that one planking shall serve as a partition between two contiguous vats. The specification describes the manner of laying the foundation timber, and of forming the floors and vertical partitions, according to this plan. In conclusion, we are informed that "the principle of this invention is designed to be applied to the construction of vats or leaches to be used for other purposes as well as for tanning. The advantages which the inventor thinks he will attain by this invention are—the saving of a considerable space usually occupied by vats in tanning—saving materials and labour in construction—diminishing liability in vats to leak or get out of order; and great facility for making repairs when necessary.

By turning to vol. xi. p. 34, it will be seen that the present patentee has been anticipated in the main object of his invention, by Mr. Wm. Brown of Herkimer county, New York; this gentleman having on the 31st June, 1832, obtained a patent in which he claims "the constructing the sides of the vats of a single board, or plank," "to allow any number of vats to be connected, without the necessity of double partitions."

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39. For an improved *Oven;* Josiah C. Carlisle, Chesterville, Kennebeck county, Maine, April 19.

This oven, we suppose, is to be built of brick, or stone; the lower part of it forms a fireplace something like that of a common stove, with an oven above it. The covering of this fireplace forms the floor of the oven, which is to be built above it in the usual arched manner; the arch, however, is to be thin, and is to have flues leading spirally over it, and terminating in a chimney. There is no claim made, and if we understand the thing, we do not believe that many persons will wish to interfere with the novelties of the invention.

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40. For a *Nursing Cup, or Artificial Nipple;* Sylvester W. Talbot, Dedham, Norfolk county, Massachusetts, April 19.

A vessel with a spout like that of a tea pot, is used to receive the milk intended for food. The end of the spout has a piece fixed on it, in the form of a nipple, and this is to be covered with India rubber, or other soft material. To prevent the too easy flow of the milk, there is to be a valve within the tube, which is to be kept closed by a slight spiral spring, the force of which may be overcome by the efforts of the child.

There is no claim made, but the design, we presume, is to patent the tube furnished with a valve. From our own observation, however, we think that whilst this makes the instrument more complex

than the common sucking bottle, with a silver tube, it is not any better than that. When the tube is made of a suitable size, the proper degree of effort will be required to draw up the milk; and thus all the advantage be obtained which is anticipated from the valve, whilst the vessel can more readily be kept clean.

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41. For apparatus for *Propelling various kinds of machinery;* Thomas L. Codman, Boston, Massachusetts, April 20.

Among the powers employed by the mechanician to give motion to instruments of various kinds, those of air, water, and animal strength, stand conspicuous; but, in general, he uses only but one of these at a time, as it is, in most cases, a thing of no small difficulty to bring them into accordance with each other, in the production of a single effect. It is the province of genius, however, to bring together, in harmonious conjunction, things which common minds would consider as incompatible, and therefore scarcely dream of placing in juxtaposition. Such a rare combination has been effected in the machine, or concatenation of machines, which is the subject of the patent before us. Horses, water, and air, and sometimes manual power also, are each to furnish their quota in making up the sum total of the power which is to be engendered. Some parts of the affair, as described, appear, it is true, rather enigmatical; but at this we ought not to be greatly surprised, as it is no new thing to assume this style in the first introduction of new and important truths. Being fearful of undertaking to epitomize the patentee's description in any considerable degree, we will give his own account of the thing, in nearly his own words.

As many horses, or other animals, as may be desired, are to be placed upon an inclined movable floor, causing a shaft and drum to revolve in the usual way. The shaft is to turn a number of eccentrics, each of which is to operate upon a forcing pump, by which water is to be raised from a cistern, and forced into a cylinder. The air in the cylinder must not be allowed to escape, but is to become condensed by the continued forcing in of the water. The air, so compressed, is to force the water from the cylinder through a tube leading from the bottom of the first into the bottom of a second cylinder; in this it is alternately to compress the bottom and top of a piston, and is to escape therefrom through two pipes, one leading from the top and the other from the bottom of this second cylinder, by both of which it is to be returned into the cistern from which it was first taken, and to be there in readiness to pass again through the same routine.

To the first named cylinder, which is represented in the drawing as standing horizontally, like those of steam engine boilers, a condensing pump is to be attached to force in air, the pressure of which may be made equal to that of several atmospheres. The eccentrics before named, operating as cranks, are to be placed on one common shaft, so as to act alternately, to keep the supply of water, and the pressure equal. Fly wheels are to be employed to regulate the motion. When air alone is to be used, the water pumps are to operate

as condensing air pumps, "the air acting in the cylinder the same as the water."

The machine to be propelled may be attached to the shaft, or piston rod of the second cylinder, drums and bands being used to increase or decrease the velocity, by varying their size. The claim is to the "manner herein described of combining and applying the herein specified powers so as to propel various kinds of machinery."

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42. For an improvement in the mode of *Measuring for Cutting Garments;* Calvin W. M. Bacon, city of New York, April 20.

We have already confessed our ignorance upon the subject in question, and although we have carefully read the specification before us, and examined the drawing accompanying it, we are still without that degree of partial light which belongs even to an entered apprentice.

The instrument described is to be made in the form of the common square used by carpenters; or it may be simply a straight scale, of two feet in length. Along this, three grooves are to be cut from end to end, into which slides are to be fitted, each of which is to be "divided into two parts, marked and graduated as hereinafter described." To us it seems that this *hereinafter* has not yet arrived, as we learn no more than that each of the sections is to be divided into parts of twelve inches, both on their upper and under sides, the slides being made capable of turning either side outwards, and being drawn out at either end. We are further told that at each end of these slides a number is marked "which represents a certain measure, the proportions of which are given by a scale marked thereon." The three slides being divided into two lengths each, and each having two divisions in width, affords twenty-four such scales, which are, it is said, sufficient for all the intended purposes of the instrument.

All that is claimed is "the convenience and facility of applying the graduated sections to the garment which is to be cut." This *convenience* and *facility* may probably be points of much importance, but they are rather intangible parts of an instrument; we suppose, however, that the patentee intended to claim the manner of constructing the graduated sections, so that they may be conveniently applied to the garment to be cut.

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43. For *Castors* to be fixed on the feet of furniture, to be called *Globe Castors;* Walter Hunt, city of New York, April 22.

The roller of this castor is to be a globe, or sphere, of glass, hard metal, or any other suitable substance, which is to be fitted into a socket, or hollow cavity, like a ball and socket joint. At the bottom of the socket, there is to be a cup, or cap, of some hard material, which is to be hollowed out so that the ball shall touch its outer rim only, which outer rim is to be rounded so as to lessen the friction as much as possible. The bearing rim of the cup should be about half the diameter of the ball, the pressure of which it sustains. The socket is to embrace about two-thirds of the ball; its lower edge is to be

notched in, so as to leave the solid part of the socket equal to the depth of half the sphere. The notched part is to be closed upon the ball by a *set*, in order to retain it in its place. To the pieces between the notches, the form of leaves, or other ornamental figures, are to be given. The inside of the socket, below the friction cap, is to be lined with cloth or other soft material, to prevent the entrance of sand, or dust, and it must not embrace the ball so firmly as to check its free motion.

The claims are to the cap with its rim upon which the globe bears; the form of the lower edge of the socket, admitting of its being readily cast whole, and of having its leafed part closed upon the ball; and the general adaptation of the whole to the formation of a castor.

The principal difficulty to be apprehended is the friction which will take place between the globe and the cap, especially in heavy articles of furniture. There are no two metals, however hard, which, without oiling, will run smoothly together for any considerable length of time; and these cannot be oiled. It is proposed to use glass, to the cup, and to bed it in cement; but this would soon be crumbled by hard blows; nor would it obviate the difficulty resulting from friction. If the globe once sticks, a flat side will be formed on it by its rubbing upon the floor; this will eventually be the case, and the operation of the thing is then forever at an end.

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44. For *Passenger Cars for Rail-roads;* John Stephenson, city of New York, April 22.

The wheels of the cars are to pass up within the body of the carriage, under the seats, which are cased over for that purpose, thus allowing the body to be hung much lower than usual. The carriage part is to be suspended under the axles; the boxes which receive them being bolted on to the upper edges of the carriage. The journals, according to the drawing, project through the wheels, and have their bearings on the outside. Leather braces are to rest on the tops of the bearing boxes, and are to be tightened by screws acting on each end of them, which screws are attached to the pillars of the body. The claims rest on the passing of the wheels up into the body of the carriage, and the method of hanging it by the braces.

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45. For a new mode of *Fastening Boats by Screws;* Joseph Francis, city of New York, April 23.

The mode of fastening here patented is applicable to clincher-built, or lap-streak, boats, which when so made the patentee denominates "portable screw boats."

Instead of using nails, spikes, or rivets, as usual, screws, with suitable heads, and with nuts and washers, are employed, both to secure the plank to the timbers, and also in the lap between the timbers. The advantages resulting from this mode of building are enumerated in the specification; among them is the ease with which the joints are drawn together, without any danger of bruising, or splitting, the wood; the facility of repairing, as by removing the screws from the two

edges of a plank, it will at once fall out, and is always ready to be used as a perfect mould for forming a new piece; and the facility with which such boats can be taken to pieces for carriage, and put together when wanted. The putting boats together by means of screws, without nuts and washers, is claimed as making a part of the invention.

Should any danger be apprehended from the working loose of the nuts, it is proposed to give a little extra length to the screws, and to spread them by rivetting; this part, when it is desirable to take the screw out, may be filed off, and the nut will then unscrew.

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46. For a *Soda Fountain;* Jacob Ebert, of Cadiz, in the state of Ohio, and George Dutty, of Wheeling, in Virginia, April 24.

This soda fountain is intended, of course, for a soda water fountain, and a very marvellous one it is. The gas is to be made within the cistern, without any such trouble as that which usually attends the process. A cistern, of copper we suppose, is to be prepared, of the usual form, and through one of its ends a tube is to descend nearly to the other end, in the common manner. The cistern is to be divided into two parts by a partition descending from the top to within an inch or two of the bottom. The tube which rises from the top, has a stop-cock, as usual; and near the bottom of the vessel there are two other cocks, or two screw caps, which serve to close the openings through which the materials are to be put into the cistern, one of them being adapted to it on each side of the partition. This constitutes the whole apparatus.

When the cistern is to be charged, it is first inverted, and the charging holes opened: through one of them a solution of tartaric or *sulphuric* acid is to be put, and through the other a carbonated alkali, as super carbonate of soda, or potash, and the required quantity of water. The holes are then to be closed, and the vessel righted, when the acid and alkali coming in contact with each other, the carbonic acid will be liberated, and the water impregnated by it.

For a fountain containing two gallons, the usual quantity, it is said, is four ounces of acid, and four ounces of alkali.

By this process we should not only obtain soda water, so called, but, with it, we may also take, by way of a blessing, a good dose of Glauber's salts, a solution of vitriolated tartar, cream of tartar, tartrate of soda, or, mayhap, of Rochelle salts. It will be very proper, therefore, for the vender of this water to inform his customers what kind of physic he is presenting to them into their bargain. We had almost forgotten one article which may give great activity to the water, and that is a good portion of blue vitriol, or sulphate of copper, which may stir up the dormant energies of the stomach, and afterwards allay them forever.

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47. For a *Washing Machine;* Larkin Smith, Guilford county, North Carolina, April 25.

This washing machine is to be a cubical box, measuring about two

feet on each side, and is to turn like a barrel churn, upon gudgeons placed on the centre of two of its opposite sides. Four pieces of plank, about eight inches wide, and the length of the inside of the box, are placed within it, one in each of the four revolving angles, dividing them equally; these are to help turn the clothes, and to catch the water, and pour it down as they rise.—There is no claim made.

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48. For *Hulling and Cleaning Rice, Barley, Broom Corn, and other small seeds;* Theodore F. Strong, and Marcus T. Moody, Northampton, Hampshire county, Massachusetts, April 26.

This patent is said to be taken for an improvement upon Strong and Moody's *Huller, Smutter, and Polisher*, patented on the 17th of November, 1832. The seeds are to be sent first through two revolving rubbers, in the form of mill stones, which are to be disks of cast iron, faced with wood, upon which is glued emery, or other hard substance; after this, through a similar apparatus, covered with card teeth, or something analogous; and then through another covered with bristles. Suitable sieves, or riddles, are also provided, and employed after each of these operations.

Instead of rubbers in the mill stone form, it is proposed sometimes to use a truncated cone, and a corresponding hollowed piece, to be covered, however, as above described. The whole apparatus is very much like that referred to as the subject of the former patent, and although this is said to be for an improvement thereon, we are not informed in what the improvement consists; nor is there any drawing of the improved parts. Now, as the patent appears to be for the instrument used, this ought to have been delineated; it can scarcely be pretended that the patent is for a process merely, for there is nothing new in the simple fact of cleaning small seeds, although there may be in the mode of doing it; but this mode must be by particular machinery, which "admits of drawings."

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49. For a *Mowing Machine;* Richard Heath, West Newbury, Essex county, Massachusetts, April 26.

The machine which is the subject of this patent is described in a very brief way, and without any attempt whatever to designate what in it is new; the general construction of it, however, is clearly shown by the aid of the drawing.

A pair of wheels is to be fitted on to an axle tree of four feet in length. Two pieces of timber, ten feet in length, are to be attached firmly to the axle tree, and to project forward from it in the manner of shafts, a cross piece near their extreme ends connecting them together. Through this cross piece a vertical shaft passes, having a whirl at its upper end, and on its lower end, below the shafts, a cross formed of two pieces of timber halved together, and intended to revolve horizontally. Each of the four ends of this cross carries a scythe, the height of these from the ground being regulated by a small truck wheel, or roller, running under the cross. A cog wheel

upon the inside of one of the first mentioned wheels, takes into another upon a spindle, or secondary shaft, revolving above the axle tree. A drum upon this shaft carries a band which passes round the whirl on the scythe shaft, to cause it to revolve. The machine is to be moved either by hand, or horse, power.

The foregoing description is more full than that contained in the specification; and those who know what has been done here and in Europe in the construction of mowing machines, will see that, in point of principle, there is no novelty, or in arrangement, any thing superior, in that now presented; we might say, indeed, that whatever may be its actual performance, it is certainly, upon paper, much less promising than many of those which have preceded it.

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50. For an improvement in *Making Clocks;* Samuel Blydenburg, and William Beebe, city of New York, April 26.

This clock is one of those whimsies, which, although they may manifest some ingenuity, are about as likely to assist the current of time, as they are to interfere with the ordinary mode of telling it. The pendulum of this horological apparatus is to be of the compound kind, with a weight both above and below the point of suspension. The pallets are attached to the pendulum, and act directly upon the escapement wheel. Upon the arbor of this wheel, there is an endless screw taking into a small toothed wheel, and another endless screw working into a pinion which carries the hour hand. These, with a small pulley and weight for a maintaining power, constitute the movement; and the whole specification consists in references to the drawings of these and of their auxiliary parts; at the end of which we are informed that "the above is a plan of a one day clock, and the addition of one more wheel makes it an eight day clock; and the addition of another wheel gives motion to another hand, both which are intended to be embraced by this specification." This constitutes the whole claim, if such it may be called.

In November last a patent was obtained by Mr. J. S. Seger, of New York, for a clock of a similar kind with the one above described, a notice of which will be found at page 315 of our last volume. Although we consider the two as belonging to the same genus, they manifestly differ in their species, and should they be sought after to be placed in the cabinets of the curious, the creative powers of our machinists may multiply this latter division to an indefinite extent.

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51. For a *Machine for Cutting Bogs and Bushes;* Thomas Spring, Granby, Hartford county, Connecticut, April 27.

We thought that bogs were bogs, and that bushes were bushes; that the latter might be cut, and that the former might be drained; but it seems, by the specification before us, that bogs are bushes, and bushes are bogs; or, in other words, that the terms are convertible, and that both of them may be cut by a patented instrument. This instrument is to be in the form of the letter V, the two branches con-

sisting of blades, or knives, with their cutting edges inwards. To the ends of these, horses or oxen are to be attached, and when drawn forward, the bogs, or bushes, collected between them are to be cut down. A handle, or guide, is to be fixed in a socket, leading back from the angular point. The blades are made capable of being set nearer together, or wider apart, being furnished with screws at the angular junction, for that purpose.

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52. For an improvement in the mode of *Hanging the Movable Beaters of the Thrashing Machine;* Holdridge Dewey, Norwich, New London county, Connecticut, April 27.

Several thrashing machines have been patented, the beaters of which are hinged, so that they can yield on striking the grain to be thrashed. Such a one was patented by Mr. Branch on the 14th of April, 1832, upon which the present purports to be an improvement; this improvement consists in checking the motion of the beaters upon their hinges, so that they shall not fall back upon the revolving cylinder, or heads. The claim is to "the mode of attaching the hinges, and the checking the swing of the beaters." The improvement is certainly not of that important character which will form a new era in the art of thrashing grain.

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53. For a *Sawing and Boring Machine;* James Hamilton, city of New York, April 29.

This machine is to be applied to the "sawing felloes of wheels, circular and curved segments, mitre joints, tenons, and also of boring felloes and hubs of wheels, circular, curved, and plain surfaces, and of sawing and boring in various ways."

From the above announcement it will be readily perceived that the machine must be one of considerable complexity, the whole apparatus being contained in one frame. The drawing, which represents it in four different views, has nearly a hundred references to it, and therefore a particular description of it will not be looked for here.

The structure of the claim is such as to confine the right to the general arrangements, substantially, as in this must be found whatever of novelty the machine may possess. The following quotation will serve as an exemplification. "And this applicant, hereby claiming his patent for the combination described, as included in one frame, substantially as the same is above described, hereby further declares that he purposes taking a patent for each of the several parts of his said improvement, or combination; that is, for the combination of the sweep with the perpendicular saw, or saws, and the scales therewith used, constructing and operating substantially as above described," &c. &c.

When these separate patents are obtained, they will afford the proper opportunity of remarking upon whatever may be considered as essentially novel in principle, as regards the inventions of the patentee, and until then we necessarily postpone any such investigation.

54. For a *Helping Power Machine;* William Loomis, Ashford, Windham county, Connecticut, April 29.

We are determined to speak a word in good time on behalf of the patentee of this invention, who will certainly, at an early period, require more help should he attempt to carry his scheme into operation; for, without some extraneous aid, his machine will not only itself stop, but will actually arrest or retard the motion of any other machinery to which it may be applied; or in the words of an old song of an inhabitant of the Emerald Isle, it will "Help the work forward with backward assistance now."

A pendulum, with a heavy weight on its end, is to be suspended to a horizontal shaft, and this pendulum is to be *aided* in its oscillations by two springs against which its rod is to strike, in passing either way. Two ratchet or escapement wheels, upon the pendulum shaft, acting in reversed directions, are to have maintaining weights, which when wound up are to keep the pendulum in motion, and the power thus obtained is to be applied from the pendulum shaft to the propelling of other machinery.

We will take the liberty of suggesting an improvement to the patentee—asking nothing, however, for the suggestion, as we would not put too high a value upon our own rattletraps—but, would it not save much trouble to apply *some part* of the excess of power in this contrivance, to the winding up of its weights?

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55. For a *Foundry Press;* William Blake, city of Boston, Massachusetts, April 29.

This press is intended to be used in foundrys, for forcing the sand into the flask, and is so made as to operate very much like the common printing press, the flask taking the place of the form in that machine. A platten is to be brought down by pulling a lever, like that of the printing press; this lever turns a circular piece of metal which has, upon its lower sides, two inclined, curved surfaces that operate upon two pistons or followers attached below to a descending platten; upon the upper end of the pistons, are friction rollers, bearing against the inclined surfaces before named; the inclination of these surfaces is such as to give a constantly increasing power, like that of the toggle joint. The bed, upon which the flask is to be placed, is run out by turning a crank, the patterns and flask are then placed upon it and the flask filled with sand; a frame is then placed upon the flask which is also filled with sand, struck off level, and on removing the frame a quantity sufficient to be forced into the flask is thus left projecting above it. Such arrangements are made as are calculated to prevent the sand from lodging and obstructing in the process.

This plan is said to give a uniform degree of solidity to the flask, and to save labour to a great extent in that kind of work to which it is applicable; the workmen being able to prepare three times the number of flasks which they can in the common way, and with much greater perfection.

56. For a *Carriage Wheel Guard;* William Zollikoffer, Middleburg, Frederick county, Maryland, April 30.

This guard is intended to hold the wheel should the linch pin come out, or the spindle of the axle break. The method of doing this is one which has been long known, although it is not generally used. Upon the inner end of the nave, or hub, a ring is placed with a projecting flanch, or flanches; and a piece of iron, fastened to the axle, hooks over, or between, these flanches, but does not touch them. When, however, the wheel obtains play, the flanch comes up against the hooked piece, or pieces, upon the axle, and is by them held in its place. These hooked pieces are capable of being loosened when the wheels require to be taken off.

The present patent is not taken for any improvement upon this plan, but goes upon the supposition that it is altogether new.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for a new mode of attaching the Soles to Boots and Shoes. Granted to SAMUEL D. BREED, *of the city of Philadelphia, April* 4, 1833.

To all whom it may concern be it known, that I, Samuel D. Breed, of the city of Philadelphia, in the state of Pennsylvania, have invented a new mode of attaching soles on to the outsides of boots and shoes, of all descriptions, whether made of leather, India rubber, or other materials, and that the following is a full and exact description of my said invention.

My method of attaching the outside sole on to boots and shoes, is by cementing the parts together by means of a solution of caoutchouc, or India rubber, as a substitute for the usual modes of sewing or pegging. For this purpose, I dissolve India rubber in rectified spirits of turpentine, the essential oil of sassafras, or some other of the essential oils. I, however, prefer the oil of sassafras to either of the others that I have tried. When the shoes are made of leather, I prepare the upper leather and inner sole in the usual manner. I then saturate both soles with the solution of caoutchouc, and if this is made of good materials, they will, in favourable weather, dry in the course of 12 hours. The parts to be cemented are then covered with a portion of the solution; the boot, or shoe, being on a last is placed on a bed, or support, of a suitable form, the outer sole placed on it, and covered by a plate of cast iron, or of any solid material of the proper shape, and submitted to that degree of pressure which shall suffice to bring into contact all the parts that are to be united. The pressure is to be continued until the cement is sufficiently dry, which, in fair weather, I have found to take place in about twenty-four hours.

Soles of caoutchouc or of leather may be joined on to caoutchouc in the same way; and socks, or shoes, of woollen or other cloth may have soles of leather or of caoutchouc attached to them by similar means.

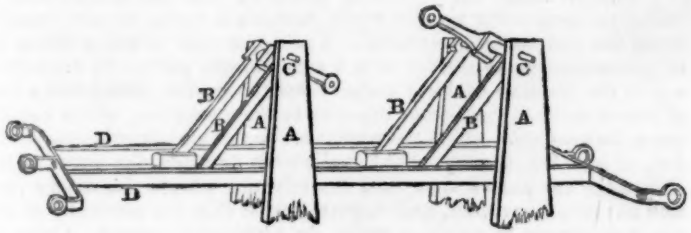
In making the cement above described, I use the articles in such proportions as shall give to the solution the consistency of strong paste.

I do not claim to have discovered the mode of making the solution of caoutchouc by means of the essential oils, this being a process which has been long known; but what I do claim as my invention is the application of this solution to the cementing of soles on to boots and shoes as a substitute for sewing or pegging.

SAMUEL D. BREED.

Specification of a patent for a new method of Working the Levers of Fire Engines. Granted to SAMUEL HUSE, *of Newburyport, Essex county, Massachusetts, April* 9, 1833.

To all whom it may concern, be it known, that I, Samuel Huse, of Newburyport, in the county of Essex, and state of Massachusetts, have invented an improved method of working the levers of fire engines, and of other similar machinery, and that the following is a full and exact description of the same, reference being had to the accompanying drawing, which makes a part of this specification.



A A A A are standards which serve to support the fulcrums of the levers B B B B, as seen at C C. The lower ends of these levers working on joints in the traversing bars D D.

The uses of the other parts represented in the drawing will be evident upon inspection, and as they make no part of my invention, but are common to many fire engines, they do not require to be described.

The object is to work engines of this description by a traversing motion, the handles being attached to the traversing bars D D, which constantly preserve their horizontal position, and rise and fall no more than is due to the segment of the curve formed by the lower ends of the levers B B.

When an engine is worked in this way, it is necessary to scotch the wheels, or in some other way to prevent a backward and forward motion in the body of the engine. This may be effected in various ways, or if preferred, there may be sliding bolts, or screws, made in the manner of legs, which may descend from the body of the engine, and support it whilst in action, independently of the wheels. I some-

times make the levers work across the engine, and in this case the wheels require but little checking.

I do not intend to confine myself, in carrying my said plan into operation, to the exact mode which I have here represented; but what I claim as my invention is the constructing the working levers of fire engines, and of similar machinery, by attaching the handles thereto, so that the levers shall work backwards and forwards in the manner of a pendulum, upon the principle herein fully set forth.

SAMUEL HUSE.

Specification of a patent for improvements in the Revolving Platform used upon Rail-roads. Granted to JOHN ELGAR, *Civil Engineer, city of Philadelphia, April* 12, 1833.

To all whom it may concern, be it known, that I, John Elgar, Civil Engineer, of the city of Philadelphia, in the state of Pennsylvania, have invented certain improvements in the mode of constructing the revolving platform, employed upon rail-roads for the purpose of turning rail-way carriages, and that the following is a full and exact description thereof.

I usually make the revolving platform, and the socket within which the projecting spindle which sustains it turns, of cast iron, as being the most suitable material. The upper side of the platform I, in preference, make convex over a considerable part of its diameter, say to the distance of thirty inches from the centre, giving to it a rise of two or three inches; from this rise to the periphery, which constitutes the part upon which the wheels are to roll and to rest, it is made flat, or has but a very slight inclination towards the outer edge. When the car passes upon this, the advance wheels rise over a portion of the convex part, and having passed this the tendency of the car is to remain in its place whilst the platform is turned. Although I think the convex form of the upper side of the platform the best, it is by no means an essential point, and it may be made flat if preferred.

There are no rails, or grooves, upon the surface of the platform, as it is not intended that the wheels shall be sustained by their tread, but by the edges of their flanches whilst upon it. The platform is consequently placed sufficiently low thus to receive the wheels, and is always in the right position for that purpose, whether intended to pass on, or to be turned round.

The under side of the platform I generally make concave, so that the water which may run from its top will not have any tendency to pass along it towards the spindle upon which it turns; or this may be prevented by the well known mode of forming a rim, or fillet, on the under side at its periphery which descends below the general surface, which, at the same time, serves to strengthen the platform.

From the centre of the platform a spindle descends into a socket prepared to receive it. I usually make the spindle about thirty inches long, about eight inches diameter at top, where it joins the platform,

and tapering down to about three inches at the bottom, where it rests in the socket upon a hemispherical end. These dimensions, however, may be varied according to circumstances.

The socket in which the spindle turns, and which is its only support, has a collar surrounding the cavity, at its upper end, which embraces the spindle; the socket rises into the concavity of the platform, when it is made concave, and approaches near to, but does not touch, its under surface. A projecting flanch surrounds its upper end, which aids in sustaining it firmly in the frame work, or masonry, in which it is fixed. When in its place neither water nor dirt can find its way into the socket, to mix with the oil, or obstruct the action of the machine.

What I claim as my invention, and for which I ask a patent, is the construction of a revolving platform for rail-roads, upon the principle hereinbefore described; that is, to obtain the revolving motion by means of a spindle and socket, without friction wheels or rollers beneath it; and the dispensing with rails and grooves to guide the car; whether the same be constructed in the exact way specified, or in any other producing a like effect, and acting on the same principle.

JOHN ELGAR.

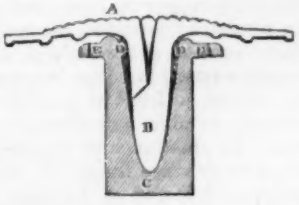
A, platform.

B, spindle.

C, socket.

D, collar.

E, flanch.



Specification of a patent for machinery for washing pulp in manufacturing paper. Granted to FRANCIS GOUCHER, *Chester county, Pennsylvania, April* 12, 1833.

To all whom it may concern, be it known, that I, Francis Goucher, of Chester county, in the state of Pennsylvania, have invented an improvement in the machinery for washing the pulp, in the manufacturing of paper, and that the following is a full and exact description thereof.

I make an opening in the side, or end, of the washing, or beating, engine, wherever the most convenient or advantageous application of power can be made, and insert a brass or copper vellum of any number to suit the quality of rags to be washed, and sufficiently large, (my present one being fifteen by twenty inches,) to allow a passage for all the water necessary for the operation of washing; and in order to obviate the suction which would arise from having the vellum only in the engine, I attach a box to the outer part of the engine opposite the vellum, and in this box fix a hog, or vertical paddle wheel, the use of

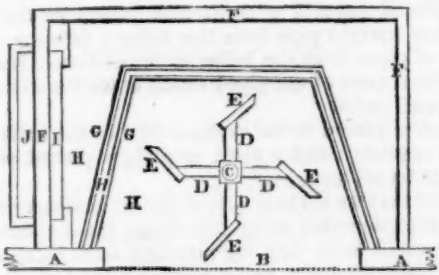
which is to agitate the water against the vellum and drive the rags from contact with it, by which a space is obtained within the engine free from the rags, and an unobstructed passage of the water allowed. The paddles on the wheel are placed at an angle of about forty-five degrees with the arms which pass through the shaft and to which the paddles are attached—this position of the paddles capacitates them for throwing the water more forcibly against the vellum within the box, than by having them (as in the common hog for suspending the pulp in vats,) perpendicular to the shaft. The discharge of the water through the vellum is regulated by a gate in the side of the box, fixed near the top so as to prevent the water sinking below the required height in the engine—otherwise the capacity for discharging the water from the box being greater than the means of supplying the engine, suction would ensue, and thus the function of the hog be counteracted—the skill and attention of the workman must be relied on for the performance of this part of the operation. The suspension of the process of washing is effected by closing the aperture in the box by the gate, and allowing the water to remain stationary therein, at the height required in the engine. It is important that the box should be perfectly water-tight, and for the better securing of this it should be composed of metal, (copper for instance,) or if of wood it should be lined with copper or lead, and soldered at the joints; otherwise a leaking would, by lowering the water in the box, cause, more or less, a constant suction at the vellum, and thereby arrest the pulp in the process of beating; but this inconvenience can be remedied by having the vellum so fixed as to slide in and out of the engine, and a brass or copper plate substituted for it when it is required to stop the washing. In this form of the vellum another advantage would be gained—two or more frames of vellum of different numbers to suit the progressive stages of the rags, could be used, and thus by using first the coarser number of vellum, to allow the more free expulsion of large particles of matter that may be to be washed out of the rags, and then the finer vellum as the state of the rags may admit.

My present box is two feet in length, one foot six inches in breadth, and one foot six inches in height; the vellum in the engine is fifteen inches wide and twenty inches long; this may be varied to suit the size of the engine, &c.; the number of the vellum is thirty, but may be coarser or finer to answer the first and progressive stages of the rags. The revolutions of the hog are eighteen to twenty per minute, which I consider the best velocity for preventing suction, and producing a smooth current in the discharge of the water through the vellum. The paddles of the hog are thirteen inches long, and four inches wide, and the diameter of the hog, from the extent of the paddles, thirteen inches. To prevent the agitation of the water at the aperture of the gate, by which its free discharge would be somewhat affected, I have constructed a box immediately around the hog inside of the other box, leaving a space between the two boxes of three inches wide at the discharging end, and two inches wide at the other extremity, and placed a bottom at three inches depth, being sufficient to carry off all the water which passes through the vellum. The water

rises and flows over the top of the inner box into the box or trough which surrounds it, and thus a smooth stream passes through the gateway. Two or more of these boxes and hogs may be used at different parts of the engine when there is a greater supply of water than can be discharged through one, or the one may be extended in size at pleasure. The driving power may be obtained from the main works (as mine is at present) by small straps and pulleys, and when it is required to stop the hog, a loose pulley is the most convenient means. The bottom of the box should be three or four inches below that of the engine, to allow the settling of the discharged particles of dirt, &c. from the engine, and prevent their running again into the engine, when the hog is stopped—the dirt thus accumulated may be discharged from the box through a plug-hole in the bottom.

What I claim as my invention, and for which I ask a patent, is the fixing of the vellum in the side of the washing, or beating vat, with a box, or reservoir, on the outer side of the vat opposite to the vellum; also the use of a revolving hog in said box, to dash the water forcibly against the vellum for the purpose of keeping it clear from the pulp, and thus allowing the water to pass unobstructed through it; and also the regulating slide, gate, or valve, in said box, or reservoir, to determine the quantity of water which shall flow through; resting my whole claim, not upon the particular parts, but upon the general arrangement of the apparatus as above described, whether the same be constructed in the exact manner herein set forth, or in any other operating upon the same principle, and producing a similar effect.

FRANCIS GOUCHER.



This drawing represents a horizontal section of the box, and of the hog, and other parts appertaining to it.

A A, a part of the side of the vat. B, the edge of the vellum covering the opening between it and the box, represented by a dotted line. C, the axis of the hog. D D, arms carrying the dashers E E. F F, edges of the box. G G, edges of the interior box. H H, spaces for water. I, edge of the gate to regulate the flow of the water out of the box J, opening into, and through which, it flows after escaping by the gate.

Specification of a patent for a Rotary Steam Generator. Granted to HARDIN BRANCH, *city of New York, April* 12, 1833.

This rotary steam generator consists of the following principal parts; viz. the vat, or cistern, to contain the fluid to be reduced to steam, and to be condensed; the pipes to convey the fluid and steam; the boiler, kettle, caldron, or receiver, in which the fluid is heated and converted into steam.

The *cistern*, or *vat*, is made of wood, and is about twelve feet long, six feet wide, and four feet deep; flaring about one foot wider at the top than at the bottom; the whole may be lined with boards, tin, or copper. A false bottom, made of inch boards, is placed about four inches from the true bottom, resting on scantling; this false bottom and scantling are thickly perforated with small holes and gains. The cistern is covered closely with folding lids, well matched together.

The *boiler*, or *kettle*, is made of metal, of any required form, to contain from 75 to 125 gallons. It is closely covered on the top with plank, packed well in the grooves with linen or oakum. At the bottom of the kettle is an opening to receive a pipe, and also one on the top, or lid, for the same purpose.

A pipe, made of wood, or of metal, about twelve feet long, and four inches diameter, extends from near the bottom of the boiler, or kettle, to near the bottom of the cistern, or vat: another pipe of about the same diameter, and about six feet long, is placed vertically at right angles with the lower one, and jointed to it closely in the cistern: another pipe of the same dimensions as the first mentioned, or lower one, is placed parallel with it, and joined to the upright pipe, and to another upright pipe from the boiler; forming together a parallelogram of pipes from the boiler to the cistern. Both the vertical and longitudinal ends of the pipes which enter the cistern, are perforated with small holes.

A *stop-cock* is placed in the vertical pipe in the boiler, to let off the steam when required; and a cork, or plug, is placed at the bottom of the cistern to let off the water.

The cistern may be divided into different compartments to contain the articles to be operated on by the steam; the divisions must be perforated with small holes like the pipe and false bottom. One of the lids may be fastened down, and the other loaded as a safety valve.

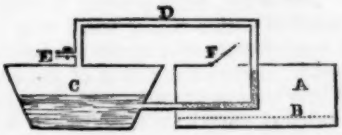
Operation.—The articles to be cooked or operated on by the steam, are placed in the compartment of the cistern; water, or other fluid, is then poured into the cistern; this enters the lower pipe through the holes, or perforations, and flows into the boiler or kettle; the fire then converts the liquid into steam, which ascends through the vertical pipe in the boiler, and along the upper longitudinal pipe, and descends the vertical pipe in the cistern, and after coming into contact with the articles to be operated on, is condensed by the cold water, or fluid, until by continual circulation the whole becomes heated, and the articles placed in the compartments of the cistern fully cooked, or fully acted on.

It is intended to apply the above apparatus to domestic cooking, chemical operations, tanning, currying, and all purposes where an extract is required from any substance.

The invention here claimed consists in the before described method of causing steam to perform a rotary operation, or circulation, by which the whole effect of the heat is used, in all the operations of cooking, or of making extracts.

HARDIN BRANCH.

A, the cistern.
B, perforated bottom.
C, boiler.
D, circulating pipe,
E, Stop-cock.
F, Cover serving as a valve.



Remarks by the Editor.

A place is given to the foregoing specification, because we happen to have a copy of it by us, not that we perceive any thing in the affair which is likely to revolutionize our kitchens, but few of which would contain an apparatus so magnificent in dimensions; should its utility be at all commensurate with the space it is to occupy, it is much to be regretted that the inventor has not afforded us more instruction as relates to the mode of applying it. We are even at some loss in attempting to trace the *circulation* which is intended to take place among its fluid contents.

From its size, this might be called a National Steam Cooking Apparatus; we hope its boiler may not burst, as the broth would then be spoilt, and all the fat be in the fire.

ENGLISH PATENTS.

To ROBERT STEIN, *gentleman, for his having invented certain improvements in distillation. Sealed 4th December,* 1828.

The subject of this patent is a still, or rather a distilling apparatus of a very complicated construction, the leading object of which appears to be that of presenting the wash, or fermented liquor, to the heat in an extremely attenuated form, or finely divided state, that is, in jets, or a shower, or, as the patentee expresses it, in the state of a mist.

The wash descends from the vat by a pipe, which conducts it through several vessels called baths, as they are surrounded by hot chambers formed by casings, or outer vessels, which constitute the passages for the steam or vapour emitted from the still to pass to the refrigerator. By these means the wash becomes heated, and the vapour cooled.

In describing this invention, we must commence at two opposite ends of the apparatus at the same time, namely, at the reservoir, on the right hand, from whence the cold liquor flows through the heated

vessels into the still, and at the boiler on the left, from which steam is passed through the still and round the wash vessels to heat them.

Bearing in mind these two prominent features, let it be observed that the still itself stands about midway between the boiler on the one hand, and the wash vat on the other; and is totally unlike stills in common use, being a long, cylindrical vessel placed horizontally, and divided into several compartments by vertical partitions made of thick cloth.

The wash, after passing through three several vessels, each surrounded with a casing filled with steam or hot vapour, is conducted in a heated state by a series of pipes leading respectively to a small force pump, connected to each of the compartments of the cylindrical still. These pumps are all acted upon by one large piston working in a cylindrical vessel, into which the wash is delivered by the pipes, and from whence it is ejected through the pumps.

Here one important feature is to be remarked:—each pump has an air vessel connected to it, by which an elastic pressure is exerted upon the surface of the wash as it rises in each pump barrel, and by that means, when the piston is set to work, the wash is thrown into the several compartments of the still in continued jets. In order, however, to divide the wash into the most minute particles, as a shower, or a mist, a plate is placed a little distance above each jet within the still, for the purpose of distributing the wash when it strikes upward, and causing it to be scattered widely over the still, and thereby become greatly exposed to the action of the heat.

Having explained the manner in which the wash is distributed in a shower, or mist, within the still, we proceed to show the mode by which it becomes heated; this is effected by the passage of steam through the still.

As before said, a boiler is placed at the left hand end of the apparatus, from whence steam rises, and is introduced into the left hand extremity of the cylinder. There it mixes itself with the heated wash in the finely divided state described, and carries away those portions which are reduced by the heat to an alcoholic vapour. The cloth partitions of the cylinder are close enough to prevent the passage of the wash from one compartment to another, but yet allow the steam and vapour to pass on to the end of the cylinder, and thence to escape through a pipe to the jacket of one of the wash vessels, when it becomes partially condensed; but that portion which remains in a state of vapour, proceeds onward to the jacket of the second wash vessel, and from thence to the third: and ultimately the most volatile part of the vapour passes down into the worm or refrigerator, and is then condensed in the form of concentrated spirit, or alcohol, from whence it is taken for rectification.

Referring again to the consideration of the wash, it is to be observed that it flows first from the reservoir placed at an elevation, into a vessel surrounded by a jacket containing the heated vapour which passes from the still, as before described; and the effect of this is, that the vapour becomes partially condensed by the cold wash, whilst the wash is heated by the hot vapour.

The wash on flowing into the second and third vessel, and the vapour passing round them, in like manner effects a transmission of the heat, which assists in condensing the vapour prior to its reaching the worm, and of heating the wash before it is injected into the still.

[*Lond. Jour.*

To JAMES FRASER, *Engineer, for his having invented or found out a new and improved arrangement of a flue, or flues, to communicate with the various parts of culinary apparatus, such as steam, soup, or water boilers, oven, or ovens, hot plate, or plates, hot closet, or closets, and stewing stove, or stoves, to render them more compact; and to appropriate parts of the said apparatus to effect other useful purposes.—Sealed 27th January,* 1829.

The subjects of this patent are divided into "*two series,*" as the patentee expresses it; that is, the adaptation of the invention, first, to a portable cooking apparatus, as a ship's hearth, and secondly, to a permanent cooking range, with oven and boiler to be fixed in the kitchen of a mansion.

The features of novelty, if there are any, connected with this invention, consist in the precise construction, arrangement, and disposition of the fireplace, flues, boiler, oven, hot plate, air vent, &c. as set forth in a series of figures accompanying the specification. As, however, these several parts of a cooking apparatus have been so variously contrived as to form a disposition in the many inventions for similar purposes which have formed the subjects of previous patents, we find ourselves, in the absence of any definite claim, unable to point out any peculiar features which we should consider to be new.

The flame and heated vapour pass from the fire in the grate under a hot plate for stewing, and then partly round an oven, and partly under a boiler, and from thence, through flues, proceed to a chimney, after having completely exhausted their heating powers.

There are dampers for shutting off the current of heat from the boiler if desired, and for directing it to any other part of the apparatus, but none of these appear to be capable of producing any new or superior effect; and the only part which is particularly insisted upon as of importance in the arrangement, is a tube, or chimney, for conducting the steam and hot air from the stewing plate, which does not communicate with the chimney, and therefore prevents the possibility of smoking the victuals while cooking.

The forms of the ship's hearth, or portable cooking stove, and the stationary stoves for the kitchens of mansions, of course differ considerably in external appearance, but a similar arrangement of the parts occurs in both, and the same apparent want of novelty presents itself; we therefore deem it unnecessary further to describe this invention.

[*Ibid.*

To Joseph Amies, *paper maker, for his invention of certain improvements in the construction of apparatus to be employed in making paper. Sealed September* 29, 1832.

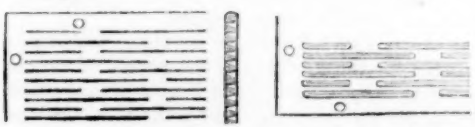
The following is the description of Mr. Amies' invention, in his specification of the above patent.

"My improvements in the construction of an apparatus to be employed in making paper, consist in a peculiar mode of constructing the bottom of a strainer or sieve to be employed for arresting the knots and lumps in pulp prepared for making paper, and in adapting the said sieves or strainers to that purpose.

"Small particles of dirt, as well as knots, lumps, and other impurities which are found accidentally mixed with paper pulp, being greatly injurious to the paper when finished. Strainers or sieves have been employed to prevent those particles, knots, or lumps, from passing with the fine fibres into the vat, or vessel, from which the pulp is immediately taken to mould the sheets of paper. The bottoms of these sieves, or strainers, have, however, been heretofore so constructed, by combining long bars or rods of metal fixed in the frames, or held together near their extremities, as to allow of very considerable vibration when the sieves, or strainers, are applied to the intended purpose. This vibration of the bars or rods, caused them to bend and become loose, and consequently to leave openings in the sieves, between which the knots and lumps were allowed to escape with the fine pulp into the making vat, thereby defeating the object intended. My improvements are therefore designed to correct this inconvenience, and are effected in the following manner:—

I form the bottoms of my improved sieves, or strainers, from plates of brass, or other suitable metal, and produce the apertures for the fine fibres of pulp to pass through by cutting short slits through such plates, taking care that sufficient space of metal is left between the ends of each short slit, and the next following, as will properly brace or strengthen the sieve or strainer. And I prefer that the end of one slit shall be nearly opposite to the middle of the two slits next adjoining it, which is commonly called breaking the joints. This is for the purpose of giving stability to the bottom of the sieve, or strainer, and constitutes the main feature of improvement which I claim in the construction of sieves, or strainers, applicable to the above purpose.

Fig. 1. 3. 2.



Figures 1, 2, and 3, represent a portion of a sieve bottom, with short slits, cut in the way described. Fig. 1 shows the face or upper surface of the plate; fig. 2, the back or under surface of the same;

fig. 3, is a transverse section of the plate. Having prepared a plate of brass, or other suitable metal, of about half an inch in thickness, its surface being smooth, I draw a series of parallel lines across the plate, at about a quarter of an inch apart. In the under surface of the plate, in the direction of these lines, I then form grooves by means of a ploughing tool, or other convenient instrument, taking care that the extremity of each alternate groove reaches to about the middle of the next groove on each side. I then, by a circular saw, or other suitable means, cut narrow slits at the bottom of each groove, of about the thirteenth of an inch wide through the plate. By this means a sieve, or strainer, is formed with narrow slits or elongated apertures, capable of allowing the fine fibres of the pulp to pass through, but stopping, or arresting, the knots and lumps. By the parts of the plate at the ends of the slits being thus left solid, and those solid portions intervening alternately between the middle parts of the two slits next adjoining, the whole plate will be firmly held together, and subject to much less vibration, or liability of bending, than long rods, or bars, which are secured at their extremities only; or of plates with long slits extending the whole length, or width, of the sieves.

In applying these sieves, or strainers, to the purpose of separating the knots, lumps, and other impurities from paper pulp, I mount the sieve in a frame, and subject it to a vibratory or jogging movement, for the purpose of assisting the progress of the fine fibres of the pulp through the slits, or apertures.

Having described the particular features of my improved sieve, or strainer, and the mode of applying the same for separating the knots, or lumps, from the fine fibres of paper pulp, I desire it to be understood, that I do not intend to confine myself to any precise length or width of the slits to be cut in the plate, forming the bottom of the sieve, nor to their distance apart, or to the thickness of the plate from which the strainer is made, all of which will depend upon the quality of the pulp to be operated on, and the speed with which the strainers are to be moved, and their dimensions, observing that the slits must not be cut completely across the plate, as that would separate it into bars; but the slits must be cut in short lengths, leaving a portion of the solid plate between the ends of each short slit; and I recommend that the slits should be so cut that two short slits in one line may terminate near the middle of the next parallel slit on each side, which will most effectually brace the parts of the sieve together, and prevent the partial vibrations complained of; but the slits may be made in rows in a line with each other, sufficient metal being left between the ends of the slits to brace, or strengthen, the sieve, or strainer, which arrangements may be found to answer the purpose; but I prefer making them as above particularly described.

Lastly, in adopting sieves, or strainers, made as above described to the separating of knots, or lumps, from the fine fibres in paper pulp, I do not intend to limit myself to the lever action and tappet wheel by which the sieve is made to vibrate, but employ, if it should be found more convenient, any other mechanical contrivance capable of pro-

ducing the required vibratory action, and I adapt these sieves to the straining of paper pulp, either for the use of hand mould vats, or of paper making machines. [*Ibid.*

¶ TRANSLATIONS FROM FOREIGN JOURNALS.

[TRANSLATED FOR THIS JOURNAL.*]

On the accidents which have occurred in the Coal Mines of the Department of the Loire from 1817 *to* 1831.

The Department of the Loire is one of the most highly favoured in France, in regard to mineral industry. Besides many iron and lead mines, it contains fifty-six coal mines, comprising a level surface of two hundred and seventy square kilometres (about 161 English square miles,) and including ninety separate centres of operation.

The establishments give employment to more than three thousand hands, with four hundred and sixty horses, and eighty-eight steam engines, of an aggregate power exceeding that of two thousand horses. These mines alone afford nearly as much coal as the other thirty-one departments where that mineral is found.

The comparative estimate of products during the last fifteen years, and the examination of different accidents that have befallen the workmen, offer results of interest, which may be seen in the table annexed to this article.

The amount of products and the number of workmen have been gradually increasing for the last fifteen years, as shown by the table; and from 1824, the time when the ground was regularly appropriated and order established, both the produce and number of workmen have augmented in a regular ratio.

The produce of 1831 is to that of 1817, as 17 to 10, and this proportion is an unequivocal sign of the existence of many branches of industry for which coal is either directly or indirectly necessary.

The quantity of coal dug out by a workman has varied from 1847 to 2287 métric quintals, (1819 to 2252 tons,) the average being 2097 quintals, (2035 tons.)

Since 1824 the number of killed and wounded among the workmen has been generally less than in the preceding years.

From the last columns of the annexed table it appears that the falling in of the ground in the subterraneous works has been the principal cause of accidents. This source of danger is inseparable from the nature of the works, and it is only by prudence and vigilance that accidents from it can be rendered less frequent.

The second source of accident is owing to the explosion of the fire damp. The directors and engineers of mines have constantly endeavoured to overcome the prejudices and inveterate habits of the miners, among whom they have at length succeeded in introducing the safety lamp invented by Sir Humphrey Davy; and it is satisfactory to observe that since the period of its introduction, in 1825, the number of victims has been considerably less.

* At the request of the Committee on Publications.

It has been remarked that Mondays are the days of the week on which most accidents happen, and this circumstance is to be attributed to the causes of accidents operating on Sundays, during the absence of the workmen.

Although most of the mines possess funds for the relief of the families of workmen, this resource has often proved inadequate; but the owners of the mines, and the inhabitants of mining districts have generously vied with each other in assisting the families rendered needy by these accidents. The government has also relieved many sufferers, and more than 4000 francs were distributed for that purpose in the year 1831.

Years.	Workmen employed.	Raw produce in metric quintals.*	Quantity of coal extracted by a workman.	Number of workmen killed.	Number of workmen wounded.	Total number of killed and wounded.	Number of workmen injured by each kind of accidents.		
							Crushes.	Gas explosions.	Falling of beams, planks, &c.
1817	1,825	3,879,840	2,135	18	27	45	22	18	5
1818	1,915	3,901,632	2,037	14	37	51	26	15	10
1819	1,927	3,337,938	1,732	20	16	36	25	7	4
1820	1,945	3,800,066	1,873	20	38	58	16	21	21
1821	2,038	4,034,910	1,979	19	33	52	19	11	22
1822	1,959	4,213,586	2,150	25	26	51	19	18	14
1823	2,259	4,513,451	1,998	32	16	48	20	19	9
1824	2,514	5,567,959	2,055	12	19	31	9	10	12
1825	2,814	5,103,886	1,956	21	21	42	21	4	17
1826	2,708	5,605,000	2,069	26	30	56	19	17	20
1827	2,733	6,252,863	2,287	17	11	28	22	1	5
1828	3,190	6,663,367	2,089	28	11	39	20	1	18
1829	2,970	6,232,900	2,098	46	16	62	16	33	13
1830	3,029	6,834,995	2,256	30	29	59	31	2	26
1831	3,053	6,342,430	2,077	30	10	40	14	2	24
Total	36,879	76,284,823		358	340	698	299	179	220

[*Annales des Mines.*

Analysis of Cow Dung.

It is known that cow dung is frequently used by dyers to cleanse printed cotton from that portion of the mordant which has not been perfectly incorporated with the cloth. The importance of this operation is easily seen, for if the superfluous mordant were not entirely removed, it would weaken the dyeing bath, and might fix the colouring matter upon parts which should have remained white. Though the property possessed by this animal matter, of carrying off the ex-

* 10 quintals make 9.85 cwt. English.

cess of mordant, by forming an insoluble compound with it, is generally known, it was not known which of its component substances has the property of uniting with metallic oxides, thereby effecting the cleansing of the cloth. M. Morin, a member of the Royal Academy of Sciences at Roan, has made an analysis of cow dung, from which it appears that this substance contains, besides some other principles, which are not very abundant in it, a peculiar matter which is soluble in water, and has the property of precipitating most metallic solutions, and which, therefore, seems to be the principle which confers the important property stated above.

As this principle, called by M. Morin *bubuline*, from the Latin word *bubulum*, (the excrementitious matter of the cow,) is very soluble in water, whilst the other substances associated with it are but little, if at all, so, it might be exclusively employed by dyers. To obtain it in solution, treat the cow dung with water, and filter; this solution will save the trouble of frequent washings of the dyed stuffs now necessary in order to free them from the encumbering mordant.

[*Recueil Industriel*, No. 72.

On the advantages of a short Arc of Vibration for the Clock Pendulum. *By* Mr. Edward Sang.

Read before the Society for the Encouragement of the Useful Arts in Scotland, 6th February, 1833.

A long intercourse with persons engaged in all the departments of machine making, has brought before me many erroneous ideas. At first I contented myself with exhibiting their fallacy as I met with them, but continued experience has convinced me that a systematic and public exposure of their nature would be of advantage to engine makers. Following up that conviction, I have projected a series of papers, two of which are already before the Society of Arts. In this, the third one, it is intended to exhibit the impolicy of long sweeps for clock pendulums, and to correct that taste which renders such movements more saleable.

In these papers, of course, I do not offer my remarks to those who, with laudable zeal, have possessed themselves of a complete knowledge of the subject. Intended for those only whose inattention, or whose want of opportunity, has prevented the acquisition of such knowledge, these remarks can hardly claim the notice of the initiated, unless, on the simple ground, that they tend to remove that barrier which separates scientific from practical men. Prevented from employing the refined and powerful methods of modern analysis, or even from adverting to the truths presented by the simple sciences, I am reluctantly compelled to combat error by assertion, and to attempt the removal of one prejudice through the agency of another.

In the present case, it would be vain to introduce an investigation of the law of motion in circular arcs, since no horologist who is able to follow that investigation can be partial to the long sweeps. Among those who are unable to follow it, an indistinct idea prevails that the motions of the pendulum may be subjected to calculation: neither

that calculation, indeed, nor the principles on which it is founded, have they subjected to examination; but then the idea of applying the pendulum to the measurement of time was first entertained by one profoundly skilled in science,—the balance-spring, the fusee, and the compensations for thermal expansion, were all results of scientific research; and it may not be impossible, say they, that, from the same mysterious source, an exact knowledge of the influence of long and short arcs on the going of a clock, may be obtained. And thus, although they do not fully appreciate the force of theoretical results, they are not yet prepared to contradict them. Such is the kind of argument to which I must appeal in support of the statements I am about to make.

If, when the pendulum of a clock is making exceedingly minute vibrations, it be adjusted to true time, and if the arc be then lengthened, the duration of the beat will be increased also. At first, this increase will be exceedingly minute, but as the arc enlarges itself, the interval between two beats will augment more and more rapidly, until the slightest change on the arc of vibration will produce a sensible effect on the clock's going. I have computed and arranged in the annexed tables, the exact amounts of the changes corresponding to each of the first twenty hundredth parts of the semicircle; by the help of these tables, we are enabled readily to compare the performances of pendulums with long or short sweeps.

Suppose that we had a clock regulated to true time when its pendulum swept an arc of twenty centesimal degrees on each side of the vertical line, and then let the maintaining power on account of the thickening of the oil, or from any other cause, be reduced to one-twentieth part, the pendulum will, keeping no account of the resistance of the air, vibrate on nineteen degrees on each side, and its daily rate will therefore be accelerated 52″ 235.

Conceive now, by an augmentation of the weight of the pendulum, and a consequent increase of friction on the knife edge, the maintaining power becomes sufficient for a sweep of only one degree on each side of the vertical line; and, having again adjusted the clock to go in true time, let the same diminution take place in the maintaining power, the arc of vibration will then be contracted to nineteen twentieths of a degree on each side, while the daily rate will experience an acceleration of 0″ 130, or rather less than the four hundredth part of the former.

When we consider then, the mere action of gravity, the superiority of the heavy pendulum with the small arc of vibration, over the light pendulum with the long sweeps, is obvious; the variation in the state of the oil, and the other inequalities of the escapement, exerting less influence on the former in a ratio duplicate of that of the arcs of vibration.

That part of the error of a clock's going which arises from variations in the buoyancy of the air, attaches alike to all pendulums of the same material; but that part which arises from the variable resistance of the atmosphere, is much less felt on the heavy pendulum. Returning to our former case, the velocity of the heavy pendulum

will be twenty times less than that of the light one, so that the resistance of air on a given extent of surface will be 400 times less; the quantity of surface, however, is 7368 times greater, while the distance through which the resistance acts is twenty times less, so that, in all, the influence which that resistance exerts in counteracting the maintaining power, is lessened 1085 times; and hence that irregularity in the going of the clock, which arises from the variable resistance of the air, will be less 400 times 1085, or upwards of 400,000 times.

On account of the increased weight, the friction on the knife-edge is increased twenty times, while the distance through which it acts is diminished as often, so that, in the case of the heavy pendulum, the friction on the knife-edge interferes with the maintaining power just as much as in the case of the light one; variations, then, in this friction, will only produce the 400 part on the disturbance on the clock's rate when the heavy pendulum is used; the edge, however, will require to be somewhat strengthened, so that this circumstance will interfere a little with these proportions.

The retardation of a clock, when the arc of vibration of its pendulum is increased, is by no means so trifling as is generally imagined; the table, I am convinced, presents results much greater than were anticipated by many, even of those who are conversant with the subject. In the formation of the table, I have taken every precaution to insure accuracy, having carried the logarithms to ten decimal places, so long as I adhered to the decimal division, and employed the ordinary tables to seven places only, in passing from that to the ordinary division of time. These circumstances, joined to that of its being new, will render it acceptable to men of science.

These statements may be confirmed by a very simple but beautiful experiment. Having suspended a leaden ball by means of a slender thread, let this simple pendulum be put in motion, so that a ball may describe curves known to bear a considerable resemblance to the ellipse. If the times of vibration along the two axes of this curve were exactly equal to each other, the ball would repeatedly retrace the same orbit; but these times of vibration are different, and during the passage from end to end of the long axis, the ball has more than returned to its position in reference to the short one, so that the axes of the orbit are gradually displaced in the direction of the movement of the ball. This displacement will be found to be most rapid when the orbit is large; as that orbit gradually contracts, the displacement of the axes becomes more and more retarded, until when the evagations do not exceed three or four degrees, it ceases to be perceptible.

To these remarks on the advantages of pendulums with short arcs of vibration, it must be added, that great practical objections lie against their being made very small; these objections, however, are founded on the peculiar nature of the escapements generally used, and, perhaps, derive additional strength from the reluctance to depart from long established, although arbitrary, rules. The beautiful escapement which lately gained the Society's highest prize, when applied, with proper precautions, low down on the pendulum rod, obviates all these objections, and offers the prospect of immense improve-

ments in time keeping. A movement on this plan is already in a state of forwardness, and I shall take pleasure in reporting to the Society he result of experiments made with it.

Half arc.	Time of vibration.	1st. difference.	2nd. difference.	3d. difference.	Clock's daily retardation	
					″	
.00	1.00000 00000	0154215	308455	080	000.000	1.332 2.666
.01	1.00001 54215	0462670	308535	129	1.332	3.998 2.663
.02	1.00006 16885	0771205	308664	185	5.330	6.661 2.666
.03	1.00015 88090	1079869	308849	235	11.991	9.327 2.664
.04	1.00024 67959	1388718	309084	289	21.318	11.991 2.664
.05	1.00038 56677	1697802	309373	341	33.309	14.655 2.664
.06	1.00055 54479	2007175	309714	394	47.964	17.319 2.664
.07	1.00075 61654	2316889	310108	447	65.283	19.983 2.664
.08	1.00098 78543	2626997	310555	501	85.266	22.647 2.663
.09	1.00125 05540	2937552	311056	554	107.913	25.310 2.662
.10	1.00154 43092	3248608	311610	611	133.223	27.972 2.663
.11	1.00186 91700	3560218	312221	658	161.195	30.635 2.661
.12	1.00222 51918	3872439	312879	720	191.830	33.296 2.662
.13	1.00261 24357	4185318	313399	769	225.126	35.958 2.661
.14	1.00303 09675	4498917	314368	830	261.084	38.619 2.660
.15	1.00348 08592	4813285	315198	879	299.703	41.279 2.659
.16	1.00396 21877	5128483	316077	942	340.982	43.938 2.660
.17	1.00447 50360	5444560	317019	992	384.920	46.598 2.658
.18	1.00501 94920	5761579	318011		431.518	49.256 2.657
.19	1.00559 56499	6079590			480.774	51.913
.20	1.00620 36089				532.687	

[*New Edinburgh Philos. Jour.*

¶ *On the application of Steam, expansively, in Cornish Steam Engines.*
By E. Galloway, Esq., Civil Engineer.*

The anxious attention which has been for some time devoted to the steam engine, with a view to its more efficient application to the propulsion of vessels, having induced an inquiry into the alleged superiority of the Cornish engines, I was solicited, in the early part of the last year, to ascertain, by experiment, the nature of the improvements,

* The reader who is familiar with the steam engine in our country, will recognise that in those conducted with special regard to economy, all the devices so much lauded in this paper are of common application: as we do not understand the author to make claim to the merit of the applications for the Cornish engines, we consider that special remark would be out of place. Com. Pub.

and the amount of advantages assignable to each. I therefore devoted several weeks to a succession of experiments on various engines, all of which tended to confirm the accuracy of the printed reports, having in every instance, found the performance to exceed, considerably, the amount stated therein.

It will not be necessary for me to describe the mode of estimating the duty of the engines in Cornwall, further than to state that the term "horse-power," which we use to express the power of a steam engine, is never used in Cornwall. As these engines are principally employed in drawing water from the mines, it is the practice to express the duty of an engine by the number of pounds it raises in a given time to the height of one foot. This is ascertained by multiplying the weight lifted in a stated period, by the height, in feet, it is lifted. Thus, if we lift 1000 pounds of water twenty feet high per minute, it would be equivalent to 20,000 lifted one foot high. The *power* of an engine, therefore, is expressed by the number of pounds it can lift one foot high in a given time; and its *expenditure* of fuel, and consequent efficiency, by the number of pounds it lifts to the height of one foot with one bushel of coals. The comparative merits of different engines, therefore, whatever be their power, or the depth of the mines, are easily ascertained by this simple process. Thus, if we describe an engine to lift one hundred millions of pounds one foot high per hour, we ascertain its *power;* but if we say it lifts one hundred millions one foot high, whilst it consumes two bushels of coal, we ascertain the work done with one bushel of coal; and by comparing that performance with that of another engine, during the consumption of the same quantity of fuel, we thereby ascertain the comparative efficiency of the two engines.

The common mode of expressing the power of a steam engine, in other parts of the kingdom, is, as I said before, by the use of the term "horse-power," which term first arose from the steam engine being employed in substitution of the labour of the horse. This term, however vague at first, has, from long use, become as expressive as any other, and conveys to those who understand it, as definite an idea of the power of the engine, as the more intelligible mode adopted by the Cornish engineers. It is only necessary to know that the power of a horse is estimated at 150 pounds lifted 220 feet per minute, or 33,000 pounds lifted one foot high per minute, and we can instantly compare the power of an engine estimated by horse power, to the power of one estimated by the Cornish method.

An experiment made by Mr. Rennie, at the instance of the Admiralty, having been tried a short time previous to my visit to Cornwall, I was induced to experiment on the same engine—Wilson's engine at Wheal Towan; and being desirous of ascertaining the maximum of effect that could be obtained by the engine being in its best possible condition, I gave such intimation of my wishes to the engineers as enabled them to have every part of it in its most efficient state. The experiment was made in the presence of Capt. N. Vivian, (to whose polite attention I am indebted not only for the opportunity of making the experiment, but for the facilities afforded me during the process,)

Mr. West, engineer, and several others. The result was, that, during six hours and five minutes, the engine consumed ten bushels of coal, raising 125,749,330 pounds one foot high with each bushel; whilst, during Mr. Rennie's experiment, the same engine only raised 92,327,000 pounds per bushel. To prevent scepticism regarding this extraordinary performance, I have to state, that, as a check on the action of the pumps, I had cisterns fitted with sluices at the top of each lift; and, at various periods during the experiment, I ascertained, by shutting down the sluices, the quantity of water delivered into each cistern by a single stroke of the engine; so that having previously ascertained the distance between each lift, and the capacity of the cisterns, an error was impossible. A very trifling difference of result was obtained by the two modes of calculation. The coals were weighed, and the stock of coals on the premises locked up during the experiment.

The best engines by Boulton and Watt, are estimated as capable of raising 19,800,000 pounds per bushel of coals. The Wheal Towan engine, therefore, during my experiment, performed *upwards of six times the duty of Boulton and Watt's engines!*

In my inquiry into the cause of this extraordinary, and almost incredible, performance, I shall first point out every variation from the Boulton and Watt engine, and then estimate, as far as is practicable, the proportion of advantages belonging to each.

The variations are—

1st. *Cylindric boilers* of considerable length. A large tube passing concentrically through them. Fire applied in the tube, and heated air made afterwards to circulate first under, and then along the sides of the boiler. The area of the side flues are generally as large as the area of the tube, and the passage is contracted by a damper being placed in the tunnel, from the boiler, to the stack or chimney.

2nd. *In the management of the fire itself.* The fire is large and thick: the fire doors open nearly to the full breadth of the tube: the coals are spread, or dusted, over the surface of the fire—the fire is *never stirred or stoked*, except at the time of cleansing. The fireman, in cleansing, (about once in twenty-four hours,) first shuts down his damper to prevent the rush of cold air, which would otherwise lower the steam in the boiler, and turns the good fuel on one side, and raking off the clinkers (the only refuse,) turns the fuel back on the clean bars, and performs the same operation with the other side. The fire, before cleansing, is about six and a half inches deep, and, after cleansing, about three to three and a half. By closing the dampers, no decrease of steam is observable during, or after, the operation of cleansing.

It is a singular fact, that those coals are preferred which, in a brisker fire, clinker most; none but Welsh coals have hitherto been used. The coal which is preferred is a mixture of various Welsh coal. The Swansea coal, however, is, I think, equal in its effect. Slannelly coal is strongly recommended, and I have since tried it with effect. Brindoway coal is spoken of very highly, and appears to possess decided advantages over the coal generally used in steam vessels; but its merits, compared to those I have mentioned, are not known.

3d. *In using steam of twenty or fifty pounds on the inch, and in expanding the steam, by cutting off the communication between the boiler and cylinder, at one-fourth or one-fifth of the stroke.*

4th. *In covering, or "cloathing," the boiler, steam pipes, steam chests, and cylinder, with a non-conducting substance, such as saw-dust or straw, where the heat of steam only can be in contact; and "cob," that is, clay and straw, over the brick work of the fire.*

5th. *In suspending the action of the piston at the completion of its stroke, allowing time for the perfect condensation of the steam in the cylinder before making the returning stroke.*

1st. *Improvement on the Boilers.*—The quantity of water evaporated with one bushel of coal, was, according to Mr. Watt, something more than eight cubic feet, converting it into steam at 220 degrees. Tredgold states, that he has evaporated ten cubic feet;* eight cubic feet is, however, found in practice to be about the mean quantity evaporated by a bushel of coal with the common boiler. During my experiment at Wheal Towan, there was evaporated 310.824 cubic feet of water, or 13.824 by each bushel of coals; being an increase of steam generated by one bushel, as 13.824 : 8.

These improvements seem principally to be effected by the judicious mode of causing the heated air to circulate through the flues, so that, as it decreases in temperature, it is made to act on colder water, which will, of course, occupy the lowest part of the boiler. More caloric is thus abstracted from the current in the flues of such boilers than where, as in the common boiler, the flues are constructed without regard to this effect.

It is, perhaps, impossible to ascertain how much of this increase of effect belongs to the management of the fire, and how much to the subsequent circulation of the caloric through the flues. Although such enormous increase of duty has arisen by the improvements in the boiler and fire, there is still a positive loss of all the caloric which is below the temperature of the water in the boiler. Mr. Sims, of the Poldice Mines, finds the air in the chimney to be 310°, whilst the water in the boiler is only 270°. It is probable that no modification could be devised, which would enable us to avail of all the caloric; but by an improvement of Capt. Samuel Grose, that is, passing the caloric from the boiler to the chimney, through tubes surrounded by water, the temperature of the water in the tube was increased from 70° to 180°. The increase of duty is estimated at one-tenth by this application, but when we look at the high temperature (310°,) at which Mr. Sims states that the air passed up the chimney, it seems probable that if all this caloric could be availed of, a much greater increase of duty would be the consequence; for the quantity of caloric wasted, being as the quantity of air passing up the chimney, multiplied by its temperature, and as the whole of the air which has circulated through the flues passes through the chimney, (though of course, considerably less expanded,) it follows that the difference between the heat evolved from the fire, and the temperature of the

* Treatise on the Steam Engine, p. 119.

water, minus the temperature of the feed water when first taken from the well, must be lost. I cannot state the exact amount of increase which might be expected from extracting the whole of the caloric from the current of air, but it will evidently be, as the heat evolved from the fire is to the temperature of the water in the boiler, so is the heat of the current, leaving the boiler, to the temperature of the feed from the well.

3d. *The expansion of steam in the cylinder, by cutting off the communication with the boiler, after the piston has made a portion of its stroke.*—This is, perhaps, the most extraordinary feature in the steam engine; and the Cornish engineers, having pursued their inquiries on this subject with great accuracy, have been enabled, mainly by the extension of the principle *within perfectly safe limits*, to obtain the enormous advantages already stated.

The merit of this invention is due to Hornblower, who, in 1781, obtained a patent for the invention. He states, that, "when steam is confined on one side of a piston, and a partial vacuum is formed on the other, the steam will move the piston, till its force be in equilibrio with the friction and uncondensed steam; and as much power as is communicated during this motion, is in addition to the ordinary effect of steam pressure." To gain power in this manner, Mr. Hornblower used two cylinders, in which the steam was to act; employing the steam after it had acted in the first cylinder, to operate a second time on the other, by permitting it to expand itself; which he did by connecting the cylinders together by proper apertures.*

Mr. Hornblower was, however, prevented from availing himself of his invention by Messrs. Boulton & Watt's monopoly for the improved mode of condensation being unexpired; and Mr. Watt, in the following year, obtained a patent for expanding his steam in one cylinder. Neither Hornblower nor Watt seemed to have intended to use high steam, and the advantages were, therefore, limited to the effect obtained by steam a little exceeding atmospheric pressure, being expanded until its effort was unable to overcome the friction of the machinery, and the resistance of the uncondensed vapour in the cylinder.

[TO BE CONTINUED.]

Some observations upon the Organ, with a plan for an improved management of the Swell, by means of a Movable Key Board.

By DR. HODGES.

The parts of which a first rate organ usually consists are four,—the great organ, the swell, the choir organ, and the (German) pedals. Of these, the second (the swell) was, up to a recent period, if it do not still continue to be, almost peculiar to this country; whilst pedals, and the art of pedal playing, were, until within these few years, comparatively as little known or studied amongst us, as the swell was upon the continent.

Pedals were of German origin, the swell was an English inven-

* Repertory of Arts, vol. iv. p. 396—1796.

tion, and each still retains its nationality. Hence, probably, might be traced some of the distinctive differences of national style and musical taste, but this would not be appropriate matter for the Repertory.* Dr. Burney says of the swell, that "it is so capable of expression and pleasing effects, that it may well be called the greatest and most important improvement that ever was made upon any keyed instrument;" a proposition which is somewhat too sweeping in its nature, seeing that the pedals long previously had added fully as much of majestic grandeur, and the extended capability of all the imposing effects of divided harmonies, in the one direction, as the swell contributed of grace, beauty, and delicacy, in the other. No organ can be deemed complete unless it possess both.

The swell has hitherto been managed by the medium of a lever pedal, placed beneath, and on the right side of, the manuals, or finger keys. This, then, when in action, exclusively usurps the *right foot;* whilst, on the other hand, pedal playing demands the active co-operation of *both the feet.* Hence a difficulty, which it is the object of the present essay to remove.

The desideratum, then, is to find a mode of giving to the performer the perfect control of the shutters, or blinds, of the swell-box, still leaving both his feet at liberty: and this has become the more necessary in this western part of the kingdom, since I introduced the mode of dispensing with a fourth part of the instrument, by planting the whole of the great organ in a capacious swell-box, thereby altogether doing away with the use of the ordinary swell-keys, pipes, and movements, and diminishing in no small degree both the cost and the size of the instrument, whilst its general effectiveness is certainly rather augmented than lessened. The swell-box, in this case, is constructed upon the principles laid down in the Quarterly Musical Magazine and Review, vol. viii. p. 395, (a work now, unhappily for musical science, defunct,) and is susceptible of a much greater crescendo and diminuendo than those who are conversant only with the swells of the London builders can have ever witnessed. But to the point, viz. the management of the swell without the intervention of the right foot.

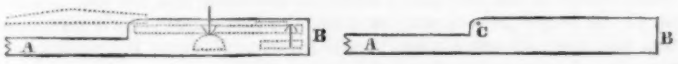
As when engaged at this instrument, both of the hands, both of the feet, the eyes, and the ears of an organist are simultaneously put in requisition, there would seem to be but little chance of employing any other part of him in the same service, unless the *trunk* could be rendered available. And accordingly in this direction I did look, in hope of finding a method of commanding the swell by the aid of the *back:* but it was quickly evident that a freedom of motion in the body is essential to the proper management of the keys, but more especially to that of the pedals. Subsequently, the idea occurred to me of making the *key-frame* perform the office of the usual pedal, or lever, of the swell, in a manner now to be described.

The proposition may, at first, be startling; but certain it is, that it

* We take this opportunity of stating, that any subject that depends upon mechanical aid for its result, is in keeping with the object of this work.—Ed.

is perfectly practicable to render the key-board capable of swinging upon an axis, or a couple of pivots, during the time of performance, without, in any degree, impairing, or impeding, the action of the movements. It will be necessary only carefully to attend to one point, viz. that the axis or centre of motion of the key-frame or board shall exactly correspond with the line at the termination of the back part of the keys, whence the key-motion is to be transmitted to the pallets, whilst the motion of the board, or frame, to which the keys are attached, shall be communicated to the swell-blinds, or shutters. Such an arrangement being made, any pressure upon the keys beyond that which is necessary to open the pallets, will depress the key-board itself, and so open the swell box. A slight sketch will make the matter more perfectly intelligible.

Fig. 1. *Fig.* 2.



Let A B C, figs. 1 and 2, represent the proposed key-board frame, the front of which, B, is capable of depression by the action of the hands upon the keys, and of subsequent elevation by the springs or weights attached to the swell shutters of whatever description. In fig. 1, a section of the keys and of the back-falls to carry off the key motion to the valves, or pallets, is exhibited by dotted lines. In fig. 2, the key-frame only is represented, in order more clearly to point out the position (*c*) of the pivots (one upon each side or end,) upon which it is to move, and which must be precisely *in the line of the bearing of the back-falls upon the termination of the keys.* Being in that relative position, it is evident that the moderate elevation or depression of the key-frame will make so slight a difference in the action of the keys upon the pallets, as to be totally imperceptible. The extent of the motion allowed to the key-frame, of course must not be considerable. Three or four inches will be found quite enough. When at *rest*, the keys should slope a little backwards; by which means, during the average of *performance*, they will probably be pretty nearly horizontal. The frame is continued towards A, to convey the motion imparted to it by the extra pressure of the fingers, beyond that which suffices to put down the keys, to the swell-shades, or blinds, in the same manner as is now effected by the action of the swell-pedal.

I am well aware that it would be utterly impossible for any mortal finger to command the action of some of our old rumbling swell-sliding-shutters of half a hundred weight, or more: but truly there is no need of any such ponderous apparatus, as I have found that *three sets* of Venetian shades, or blinds of about a quarter of an inch in thickness, covered on each side with thin milled-board, (very thick paper,*) still worked so easily as to require the addition of a very powerful spring, or heavy weight, before sufficient resistance was obtained to balance the foot, prior to which a single finger sufficed to

* An excellent non-conductor of sound.

depress the pedal. Of course it will not be necessary to obtain that resistance upon the present plan, but merely to furnish a spring having just power enough to close the swell-box, and to restore the keys to their proper position.

Neither does this scheme militate against the retention of the swell-pedal now in use. It may still be retained for occasional employment, and a hundred methods may be devised of fixing the swell-key-frame in one immovable position for any occasional temporary purpose.

The peculiar advantage derivable from the plan now proposed, is not confined to the liberation of the right foot for the service of the pedals, although that alone is of material importance,—but points at another result which cannot but contribute in no small degree to increase the effectiveness of the swell itself. Upon the old plan, the concurrence of the combined action of the hand and the foot is necessary; the finger puts down the note, the foot imparts to it its character, and both do not always "pull together:" upon the present, the same hand which puts down the key, will have to convey the impress of "expression" also, and this will follow very naturally, and without the imposition of any new difficulty. Whether, from the universal prevalence of the piano-forte, or from any more remote and innate cause, it is so habitual to every performer upon a keyed instrument, to increase the pressure of his fingers whenever he requires increased force in the effect of his performance, the one is so closely connected with the other, that when he has once overcome the transient embarrassment which may probably arise from the unwonted instability of the key-board, I doubt not but that he will experience a sensible relief from the present cumbrous mechanism, in the simplicity and unity of action gained by the plan now proposed, and that he will feel as grateful for the liberation of his dexter leg, as though he had received the *gratuity of an additional limb.*

Cloisters, Bristol, May 16, 1833. E. H.

[*Rep. Pat. Inv.*

On the application of Caoutchouc to different manufactures, and particularly to Elastic Web.

From a paper read at the Royal Institution by Mr. Brockedon.

The lecturer stated, that although his object was to explain the application of caoutchouc to elastic fabrics, yet, perhaps, it would be interesting to give a short account of the early knowledge of the material in this country; for although it has been known here about 100 years, yet very little of its useful properties were discovered till within the last ten or fifteen years, when Mr. Hancock took out his patent for applying it in its elastic character, and used it as springs for gloves, and a variety of other articles, by sewing threads of the elastic gum between two surfaces, as described in his specification. A patent was also taken out in the name of Mackintosh, for placing

a thin layer of caoutchouc between two thicknesses of cloth, and thus rendering the same water proof, since which other patents have been taken out with reference to this subject.

From the first knowledge in Europe of the source of caoutchouc, and the means of its production, we appear to have been indebted to some French academicians who were sent out for the purpose of astronomical observations in 1735; they discovered that it was a white milky juice of certain plants, found abundantly in Para in the Brazils, in Quito, and since found in Asia, and several other places—a specimen of one of the trees was on the table—they grow so extensively in some places, that hundreds of miles are covered with them; thus there is no fear of the material falling short of the demand. One of the first purposes to which caoutchouc was applied, appears to have been the well known property of rubbing out black-lead pencil marks, and hence probably originated the name, of India rubber, by which it is now better known in this country.

The lecturer here read the following note from the London and Edinburgh Philosophical Magazine for January, 1833:—

"Few persons are perhaps aware of the comparatively late introduction of India rubber into this country. The following notice is appended by Dr. Priestly to the preface to his 'Familiar Introduction to the Theory and Practice of Perspective,' printed in 1770; but it will be observed that no name is given to the substance described: 'Since this work was printed off, I have seen a substance excellently adapted to the purpose of wiping from paper the marks of a black-lead pencil. It must, therefore, be of singular use to those who practice drawing. It is sold by Mr. Nairne, mathematical instrument maker, opposite the Royal Exchange. He sells a cubical piece, of about half an inch, for three shillings; and he says it will last several years.' "

Most persons have seen the various forms in which caoutchouc is imported into this country, that is, either in large hard cakes, or in the form of bottles, which last, it is possible, were originally made by the natives for the purpose of holding liquids; they formed these bottles by making a mould of clay, and then permitting the white milky juice to run all over its surface till there was a thin layer or coat; in this state it was held over a fire to dry, and hence its black colour, from the smoke: when dry, it is covered with another coat of the juice, which was also dried, and so on till sufficient thickness was obtained. The clay was then removed from the inside by breaking it into fine powder, and permitting it to pass out of the neck of the bottle.

It being known that the original condition of the caoutchouc was the fluid state, solvents were sought and found. These are various—the essential oil of coal tar, the oil of sassafras, the essential oil of turpentine, and some others. It is also soluble in fat oils, particularly in those of almonds and olives. Professor Mitchell says, that the most perfect of the solvents is the oil of sassafras, as it evaporates entirely, and the caoutchouc recovers all its qualities, whilst all the other solvents cause a greater or less change in its quality. The lec-

turer then showed and explained a great variety of fabrics which were on the table, in which there was one principle pervading the whole, that is, the warp, or longitudinal threads, were of caoutchouc, and the weft, or cross threads, of cotton, silk, or linen, according to the object of the fabric. There was also a machine for making elastic braid, by covering a thread of caoutchouc with silk or other threads. The lecturer then explained, that the threads of caoutchouc were produced by cutting it, by means of a machine, with the greatest evenness and equality. One pound will make a thread (known in the trade as No. 5,) eight thousand yards in length, which was the average thickness of the thread used; but this thread, by the machine, might be again cut longitudinally into four, making in the whole thirty-two thousand yards from one pound of caoutchouc; and such is the facility obtained by the machinery, that two girls are capable of cutting thirty pounds per day, producing 240,000 yards of No. 5 thread. In working threads of caoutchouc it will be found that if they are kept stretched for any length of time, and are exposed to cold, they become set to the length to which they have been stretched, and will no longer have elasticity; but by the application of heat, the threads will return to their original length, and become again elastic; consequently in weaving fabrics with warp threads of caoutchouc, produced as before stated, the fabrics, when first woven, are not elastic, nor can they be extended to a greater length; and in order to obtain elasticity in such fabrics, a hot iron is passed over them, by which means the warp threads of caoutchouc shrink back to their original length, and then become elastic. In some instances where the elastic fabric would be liable to be extended beyond the ultimate power of the elasticity of the caoutchouc, in place of having all the warp threads of the elastic gum, alternate threads of cotton, silk, or linen, are placed in the loom; by this means the fabric cannot be stretched beyond the ultimate power of the elastic elongation of the caoutchouc, as the strain would then come on the warp threads of cotton, silk, or linen, and prevent the fabric being further stretched.

The lecturer spoke of the powers of distension of caoutchouc in reference to the blowing out bottles into balls and balloons, and mentioned some instances where a piece of the size of a walnut had been distended to the extent of fifty inches in diameter; the means were to boil the material for an hour or two, and then to expand it by blowing. Within a few years the material sold for five and six shillings the pound, now any quantity may be had at a quarter that cost, even with the increased demand. The lecturer then mentioned a liquid which had been discovered by Messrs. Cornish & Co., but the nature of which was a secret, by which caoutchouc which is rotten, and has lost its elasticity, may be perfectly recovered in a few minutes. Mr. Brockedon concluded his very interesting and instructive lecture by stating, that the application of the material on which he had been treating, was but in its infancy, although great strides had been made within a few years; Messrs. Cornish & Co., Mr. Sevier, Mr. Hancock, and some others to whom he had been indebted for information,

were still going to great expense in a variety of new applications which he was not at liberty at present to mention. [*Ibid.*

¶ *Report of Messrs. Walker and Burges, Civil Engineers, on the state of Blackfriars Bridge.*

Since the worthy citizens of London have been reckoning up what it has cost them to build their new bridge and take down the old one, and contrasting the immensity of the expenditure with the insignificant amount of positive good which they have derived from it, an opinion is, with good reason, gaining ground among them, that they have paid excessively dear for their whistle. Two millions is, certainly, an enormous sum, in times of national distress especially, to lavish on a mere matter of taste; for, after all the outcry that was raised against the old bridge, on account of the injury it was *said* to cause to the navigation of the river, every one is now at a loss to discover what the navigation has gained by its removal, while for every purpose of land traffic the old bridge was nearly as good as the new—being equally straight, almost as wide, quite as strong, and inferior principally in architectural elegance. The whole affair in truth was a prodigious job, and prodigiously the children of Gog and Magog have paid for it. The good citizens are even denied the consolation of thinking that they have seen the end of their folly, for to the two millions already expended, many thousands, if not millions more, must yet be added, to defray the expense of various necessary changes consequent upon the change of the old bridge for the new. A sum of £90,000 is now required to save Blackfriars bridge from the total ruin with which it is threatened, chiefly through the alteration caused in the general state of the river, by the removal of the dam at Old London Bridge. The measures taken to protect Westminster Bridge from a like catastrophe cannot have cost much less. And there is, probably, not a single proprietor on either side of the river, above the site of Old London Bridge, who will not, sooner or later, be obliged to adopt similar defensive measures for the protection of his premises. Neither can any one of the gulled multitude claim the saving benefit of a "Who would have thought it?" For there is not a single circumstance in this long train of loss and damage, which was not distinctly predicted by the most eminent men of science of the age, *before* the edict passed for the destruction of the old bridge. Every thing is happening precisely as Mr. Smeaton, Mr. Telford, Dr. Gregory, and others, foretold, and as we did our best, about two years ago, to remind the public would assuredly happen, unless averted by such remedial measures as were still, at the eleventh hour, capable of being carried into effect.

On the 27th of September last, (that is, not till more than a whole year after the opening of the new London Bridge had elapsed,) the Court of Common Council appointed a committee to take the necessary measures to ascertain the effects which the change in the river had made on the condition of Blackfriars Bridge, and how they might

best be remedied. Messrs. Walker and Burges, civil engineers, were selected by this committee to make a survey of the bridge, and an estimate of the necessary repairs; and on the 25th of April last, the report of these gentlemen was laid before the Common Council. We have now a copy of this report before us, and as it contains matter of great interest to the public at large, as well as to the engineer profession, we shall transfer it, with but little abridgment, to our pages.

Report.

Our first object was the survey of the bridge, and for that purpose we naturally expected to be furnished with some plans, or other information as to its construction. In this, we have been disappointed. Although the bridge was built under the direction of the city of London, there do not appear to be any plans or documents in the possession of the corporation, that give the smallest assistance in any of the objects of our inquiry.

* * * *

As the common diving bell appeared to us from its size to be inconvenient for examining the foundation, without a large excavation near the piers, which it was desirable to avoid, and from its not affording the opportunity of examining the vertical face of the stone work, we applied to Mr. Barnard, the member of Parliament for Greenwich, who has an interest in Deane's patent diving helmet, for the use of that machine. Mr. Deane brought it from Portsmouth, and has attended us during the survey, having, as well as ourselves, frequently descended to the foundations, and examined the work by means of it.

Timber and stone of foundations.—The first particular object of our survey was the condition of the timber and stone work of the foundations of the piers. For this purpose excavations were made by dredging down quite to, and under, the level of the caisson bottoms; and the condition, as well as the levels, of the timbers, of which we took several specimens, were ascertained beyond doubt by the diving helmet. In cases where digging and examination by the diving helmet were thought unnecessary, boring was resorted to, and we are enabled to say that the timber which forms the foundation of the piers, is in a sound and perfect state. The specimens, when first cut, appeared as bright and fresh coloured as new timber.

Every part of the bridge, so far as we have ascertained, is built of Portland stone, which is of a soft calcareous nature, and subject to decay from exposure to the weather; but we can, from our surveys, state with some confidence that all the stone work, from the foundation up to low water mark, is as good as the day it was laid, the mortar entire in the joints, and the tool marks remaining on the faces of the stones.

Levels of piers.—Our report of the levels of piers, both as respects the different points of the same pier, and comparing them with each other, is also favourable. We have attached to this report a list of the comparative levels, to which we beg to refer: it will be seen that the greatest inequality in the level of any one pier, does not exceed four

and a half inches, and that the greatest variation in any two points of different piers, is not more than six inches. Supposing even that all the points referred to were originally quite level, which with caissons it is very difficult to accomplish, the work has settled very little, and there would be nothing to apprehend on this score if the state of the river had continued the same as when the bridge was built, or as it was previously to the removal of the London Bridge, or probably, with little exception, even in its present state.

General state of bridge.—As respects, therefore, the state of the bridge itself, it may be safely affirmed that up to low water mark it is perfect, and that the imperfections of the stone work begin from that level. The repairs which are required above it are fully described in the accompanying specification, to which we beg to refer, and shall here only state the principal features, and our reasons for recommending works to the extent we have specified.

Piers and abutments.—From the level of low water, before the removal of London Bridge, to nearly the high water mark, the whole of the stone work forming the front of the piers and abutments, is in so very dilapidated a condition as to make new facing with better stone, the only prudent and safe plan of repair. The ends, or cutwaters, of the piers being more exposed to blows from barges and ice, are still more damaged, and so shaken as to render renewal from the footings absolutely necessary.

Levels of tides and facings required.—Previously to the removal of London Bridge, the low water mark was seldom under the top of the offset courses of the piers, and in the great proportion of tides still higher, so as to protect the first course above the footings, which is in a much better condition than those above it. The result of the removal of the old bridge has already been to reduce the level of low water about twenty-two inches at Blackfriars Bridge, and as this effect will increase as the remainder of the piers of London Bridge are cleared away, we have no hesitation in recommending that the new facing should commence from the offsets,* and be carried one course, or about two feet three inches, on the average, above high water of ordinary spring tides. *Extreme* tides are three feet above the level of ordinary spring tides, but as such tides occur seldom, their action on the stone is not to be feared. We consider that the effect on the high water above London Bridge, by the removal of the old structure, is already produced to nearly its full extent, which we never considered would be more than raising the level above one foot, as stated in Messrs. Walker and Leach's Report to the Navigation Committee in 1821, being the amount to which the old bridge acted as an obstruction to the free flow of the tide, or the difference between the level of high water on the two sides of the bridge. The level proposed for terminating the new facing we therefore think ample: the whole height of new work will be eighteen feet and three inches, which will extend round all the piers, and in addition to this, the quoins of the arches

* This is supposing the repairs to be done without the coffre-dams hereafter referred to.

will be renewed five feet higher. We propose the cutwaters and shoulders of the piers, and the quoins, or facing arch stones, to be of granite, the other parts to be of Bramleyfall, or some other equally durable stone.

Columns.—From the very dilapidated state of the cutwaters of the piers, the columns which rest upon them are endangered, particularly towards their bases, by which the high tides have reached and decayed the stone: some of them have besides been struck by barges which have displaced the lower stones of the shafts, so that these columns are really dangerous. A heavy blow on the disturbed stones might be the means of throwing down the column altogether, and the recess over it would follow; the consequences of this might be very serious, both with reference to the lives of the persons in the barge, and of those in the recess at the time, who would probably be precipitated with the falling columns into the river.

[TO BE CONTINUED.]

Preservation of substances by means of alkalies.

M. Payen has preserved during many months polished instruments of iron and steel, by keeping them in solutions of potash and soda—saturated solutions, diluted with one, two, or three times their weight in water. He at first thought that the preserving power depended upon the disappearance of the air and carbonic acid in the alkaline mixture, but he afterwards concluded that alkalinity acted an essential part in the phenomenon. In fact, a very small quantity of alkali is sufficient: thus $\frac{2}{1000}$, and even $\frac{3}{1000}$ of caustic potash in water, will preserve from oxidation bars of iron, &c. immersed in it. Lime-water, diluted with its own weight of water, or, of course, without dilution, answers the same purpose. Alkaline carbonates and borax have the same effect, but they must necessarily be stronger.

[*New Edinburgh Philos. Jour.*

¶ *Composition of the Silver Bell at Rouen.*

M. Girardin, professor of Chemistry, has, by a careful analysis, ascertained that it does not contain any silver. One hundred parts by weight contain—

Coppper	71
Brass	26
Zinc	1.80
Iron	1.20
	100

Modern French bells differ but little from the above, being composed of—

Copper	78
Brass	22
	100

Thus, the popular opinion which has long existed, that the old church bells contained a smaller or larger portion of silver, is destroyed by the efforts of science. [*Rep. Pat. Inv.*

¶ *Immersion of Conical Bodies.*

An interresting experiment was put in practice in this dockyard, (Devonport,) a short time since, to prove the fallacy of the naval doctrine, that a floating body, conically shaped, may be more easily immersed with the apex upwards than if it were reversed. A new buoy, accurately shaped, which your readers know is formed like two hollow cones united at their base, was carefully marked round the centre and loaded with iron until it sunk to the middle; it was then taken up and weighed against as much more iron as would exactly balance it, and on being put again into the water, it appeared that the whole of the iron weighed against it was required to immerse the other half of the buoy, which then floated with its top just under the water's edge; thus proving that precisely the same weight was necessary to immerse the upper part of the buoy or cone, with its apex uppermost, as that required to sink the lower half or cone in the inverted position. [*United Service Journal.*

Portable Milk.

M. Dorchoff, the Russian chemist, who sometime since discovered the process of making starch into sugar, has lately made several experiments upon milk; the result of which he has arrived at is curious. He is said to have found a mode of keeping milk for use for any definite space of time. The process of preserving is this,—he causes new milk to be evaporated over a slow fire, until it is reduced to powder. This powder is then put into a bottle, which is hermetically sealed. When the milk is wanted for use, it is only to dissolve some of the powder in a suitable quantity of water, and the mixture so dissolved will have all the qualities, as well as the taste of milk. [*Ed. Agri. Jour. & New Ed. Philos. Jour.*

¶ *Stucco for Walls.*

In Italy great use is made of a stucco which gives to the walls the brilliancy, the cleanliness, and almost the hardness, of marble. It may be variously coloured, to suit the taste of the employer. This stucco is made very easily, by mixing lime and pulverized marble, in nearly equal proportions, according to the meagreness or richness of the marble. A paste, or mortar, is made of this mixture, and applied to the wall in the thickness of a five franc piece, with a trowel wet with soap suds, and in such a way that the whole of the wall may be finished in the same day. None but mineral colours should be mixed with the stucco, as the lime would destroy those derived from the vegetable kingdom. To obtain the greatest brilliancy, the mor-

tar should be applied with a cold trowel. Workmen, for the sake of ease and expedition, usually employ it warm. Chips and fragments of marble may be advantageously employed for this purpose. In cases where the appearance of a marble wall would be objectionable on account of its coldness, any portion of it may be covered with paper. [*New Ed. Philos. Jour.*

Meteorological Observations for August, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches				Inches.	
☽	1	56°	76°	29.90	29.90	47°	W.	Moderate.		Clear day.
	2	64	83	.85	.85	55	W.	do.		Lightly cloudy—clear.
	3	65	83	.85	.90	63	W.	do.		Clear day.
	4	68	83	.85	.85	63	S.	do.		Foggy—flying clouds.
	5	69	74	.85	.85	66	SE.	do.		Fog—cloudy—rain.
	6	71	78	.83	.83	73	E.	do.	0.40	Cloudy—showery.
	7	70	80	.80	.80	73	W.	do.		Flying clouds—cloudy.
	8	64	80	.90	.90	65	W.	do.		Clear day.
	9	62	74	.80	.80	52	SW. W.	Brisk.	0.25	showers—clear.
	10	53	72	.90	.90	52	NW.	Moderate.		Clear day.
	11	56	74	30.00	30.00	53	W.	do.		Clear day.
	12	60	70	29.80	.90	64	S.	Brisk.		Clear—cloudy.
	13	72	84	.60	.60	58	SW.	do.		Cloudy—flying clouds.
⊗	14	64	80	.70	.70	60	W.	do.		Clear day.
	15	64	82	.70	.70	63	W.	Moderate.	0.62	Clear—shower.
	16	64	70	.75	.80	60	W. S.	do.	1.29	Cloudy—heavy shower.
	17	64	76	.90	.90	57	W.	Brisk.		Cloudy—clear.
	18	59	74	.90	.90	53	W.	do.		Clear day.
	19	54	77	.95	.90	44	W.	do.		Clear day.
	20	56	79	30.00	30.00	56	W.	Moderate.		Clear day.
	21	57	74	.00	.00	56	W.	do.		Lightly cloudy—clear.
	22	64	76	29.90	29.90	60	NE.	do.		Clear day.
☾	23	68	74	.80	.80	63	E.	do.		Cloudy day.
	24	64	72	30.00	30.00	50	W.	do.		Clear day.
	25	58	76	.05	.00	58	W.	do.		Clear day.
	26	58	84	29.80	29.60	62	W.	do.		Cloudy—clear.
	27	62	69	.85	.70	57	W.	Brisk.		Clear day.
	28	50	64	.80	.80	45	W.	do.		Clear day.
	29	49	69	30.00	30.05	43	W.	Moderate.		Clear day.
	30	59	73	.00	29.90	47	W.	do.		Lightly cloudy—clear.
☉	31	60	76	.00	30.00	60	W.	do.		Clear day.
	Mean	61.90	76.87	29.86	29.88	58.5			2.56	

	Thermometer.	Barometer.
Maximum height during the month,	84. on 5th, 13th, 26th.	30.05 on 25th, 29th.
Minimum do.	49. on 29th.	29.60 on 13th, 26th.
Mean do.	69.38	29.87